4.10 Internetworking Subsystem (ISS)

4.10.1 Introduction

The Internetworking Subsystem provides for the transfer of data transparently between end systems within local and wide area networks. The primary aspects of ISS development include:

- selection of internetworking protocols and standards to be used to satisfy ECS requirements;
- selection of vendor implementation of chosen protocols and standards; and
- design of internetworking topology.

ECS is responsible for designing and developing the EOSDIS Science Network (ESN) Local area networks (LANs). The ESN LANs are responsible for transfer of data within the DAACs, SMC and EOC, and for providing interfaces between these components and to external networks. Other networks, including EBnet and NSI, will provide wide-area services to ECS. In addition, "campus" networks, which form the existing networking infrastructure at the ECS locations, will provide connectivity to EOSDIS components such as Science Computing Facilities (SCFs) and Instrument Support Terminals (ISTs).

The ESN WAN and Ecom have now been consolidated into a single network called the EOSDIS Backbone Network (EBnet). EBnet will be developed under the control of GSFC Code 540. This consolidation requires changes to the ECS contractual and technical baseline, involving modification or deletion of ECS Level 4 requirements andmodification and deletion of some Level 3 requirements. The contractual vehicles (such as CCRs and Change Orders) necessary to formalize and finalize the consolidation are currently being worked but are not yet complete. To avoid confusion and to reflect the topology that will eventually be in place, the ISS requirements contained in this section are based on the assumption that the EBnet consolidation is formalized. Therefore, references are made to EBnet in place of Ecom, and there are no requirements relating to transporting data between DAACs, since this is now the responsibility of EBnet. The assumption may result in certain Level 3 requirements being untraced to Release B Level 4s.

4.10.2 Internetworking Subsystem Summary

4.10.2.1 Subsystem Interfaces

ISS provides for transport and network layer interfaces with all external systems. All external interfaces use the Internet Protocol (IP) suite, and exchanges of data are characterized as exchanges of network layer protocol services as described by the IP suite. Table 4.10-1 summarizes the ISS external interfaces to network providers and external end systems, as required for Release B.

Table 4.10-1. ISS/External Interfaces (1 of 2)

ISS LAN	Network Provider Interface	External End System Interface
GSFC DAAC LAN	NSI	External users, including SCFs
GSFC DAAC LAN	TSDIS LAN	TSDIS
GSFC DAAC LAN	EBnet	NOAA
GSFC DAAC LAN	EBnet	EDOS (for L0 MODIS data)
GSFC DAAC LAN	EBnet	International Partners; other DAACs
GSFC DAAC LAN	GSFC Campus Network	Color ingest; external users located on the GSFC Campus Network, including SCFs
GSFC DAAC LAN	GSFC V0 DAAC LAN	V0 Systems
LaRC DAAC LAN	NSI	External users, including SCFs
LaRC DAAC LAN	EBnet	EDOS (L0 CERES, MISR, and MOPPIT data from AM-1)
LaRC DAAC LAN	EBnet	SDPF (L0 CERES data from TRMM)
LaRC DAAC LAN	LaRC Campus Network	External users located on the LaRC Campus Network, including SCFs
LaRC DAAC LAN	TBD	L0 ACRIM and SAGE III data
LaRC DAAC LAN	EBnet	International Partners; other DAACs
LaRC DAAC LAN	LaRC V0 DAAC LAN	V0 Systems
EDC DAAC LAN	NSI	External users, including SCFs
EDC DAAC LAN	EDC Campus Network	External users located on the EDC Campus Network
EDC DAAC LAN	Landsat Production System Network	Landsat Production System
EDC DAAC LAN	EBnet	International Partners; other DAACs
EDC DAAC LAN	EDC V0 DAAC LAN	V0 Systems
EOC LAN	EBnet	EDOS, EDF
EOC LAN	NSI	ISTs
EOC LAN	GSFC Campus Network	ISTs located on the GSFC Campus
JPL DAAC LAN	NSI	external users, including SCFs
JPL DAAC LAN	EBnet	International Partners; other DAACs
JPL DAAC LAN	EBnet	L0 SeaWinds and SSALT
JPL DAAC LAN	JPL V0 DAAC LAN	V0 Systems
ASF DAAC LAN	NSI	external users, including SCFs

Table 4.10-1. ISS/External Interfaces (2 of 2)

ISS LAN	Network Provider Interface	External End System Interface
ASF DAAC LAN	EBnet	International Partners; other DAACs
ASF DAAC LAN	ASF	ASF production and archival systems (for ERS-1/2, JERS-1, and RADARSAT data)
ASF DAAC LAN	ASF V0 DAAC LAN	V0 Systems
ORNL DAAC LAN	ORNL Internet Provider	International Partners; other DAACs
ORNL DAAC LAN	ORNL DAAC Processing/ Archive	Transfer of metadata to ECS and transfer of product requests to ORNL
NSIDC DAAC LAN	NSI	external users, including SCFs
NSIDC DAAC LAN	EBnet	International Partners; other DAACs (including GSFC for MODIS data)

The ISS interface diagram (Figure 4.10-1) is an interconnection diagram. Because ISS operates at the lower four layers of the OSI reference model (e.g., from the physical to the transport layer), it connects end systems together by communicating messages from one machine to the other. In this sense, ISS neither sources nor sinks the messages, but rather transports them from one machine to another. Thus, Table 4.10-1 and Figure 4.10-1 show interfaces to systems which ISS directly connects to (such as NSI or EBnet), but does not show interfaces to systems to which ISS does not directly connect (such as SCFs and EDOS). For instance, ISS interfaces to EBnet to carry L0 data from EDOS, but ISS does not directly interface with EDOS itself.

ISS also provides layer one through four services to ECS internal subsystems. It is responsible for providing communications pathways between unique subsystem HWCIs in the same way it does between ECS and external systems as described above. ISS generally carries data originating from and destined for other subsystems. The only exception to this is for data flows between ISS and the MSS subsystem, consisting of status requests from MSS and responses from ISS to MSS.

4.10.2.2 CSCI Overview

4.10.2.2.1 Internetworking (INCI) CSCI

The ISS Internetworking Software CI (ISS-INCI) contains all ISS software, standards, and protocols required to provide ISS services. The ISS-INCI provides services corresponding to the lower four layers of the OSI reference model, from the Datalink/Physical layer (such as Ethernet and FDDI) to the network layer (such as IP) to the transport layer (such as UDP and TCP).

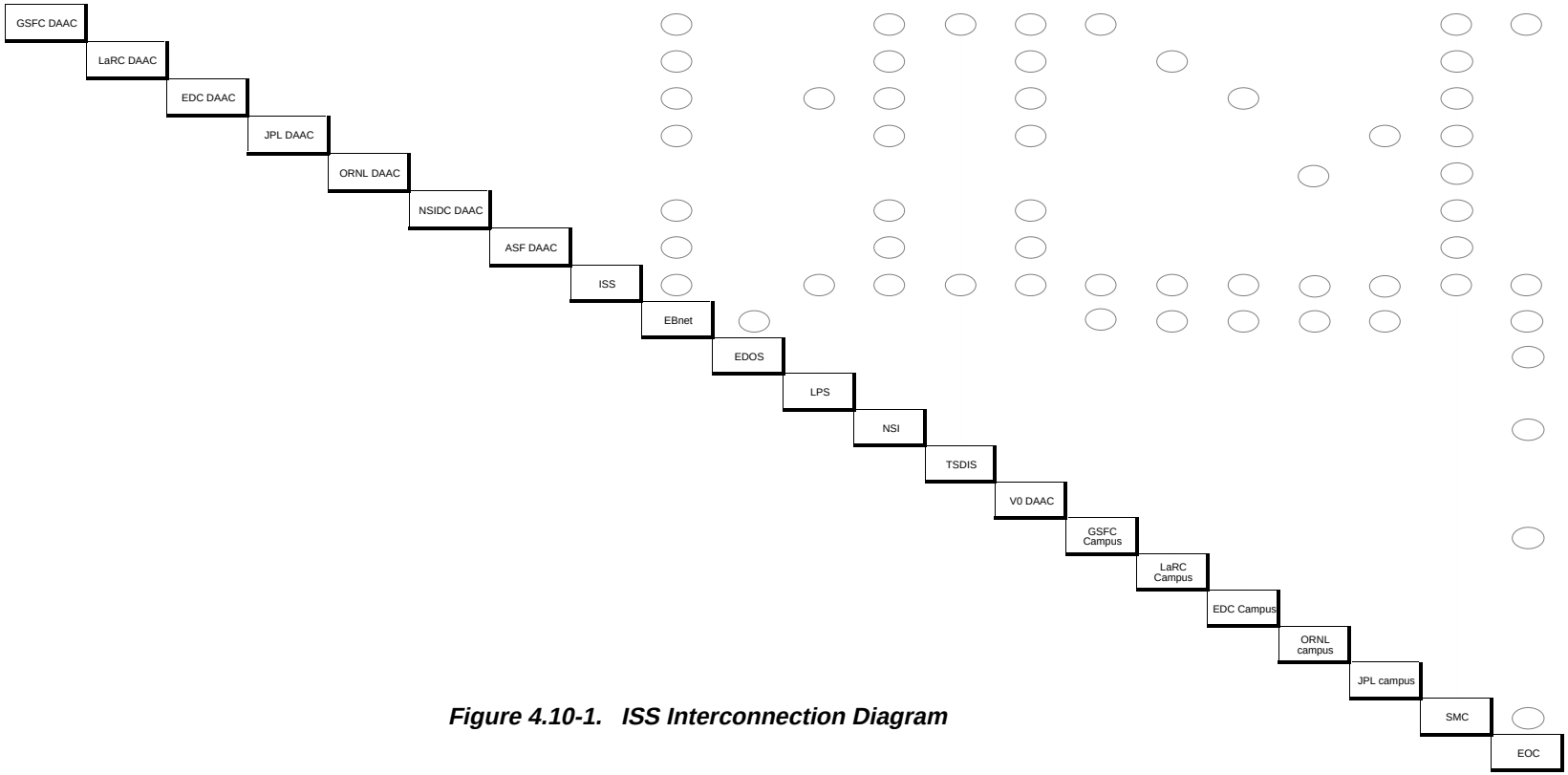

Figure 4.10-1. ISS Interconnection Diagram

4.10.2.2.2 Internetworking Hardware (INHCI) HWCI

The ISS Internetworking Hardware CI (ISS-INHCI) is the hardware to host all ISS software described. The ISS-INHCI logically includes routers, hubs, switches, LAN analyzers, and plant cabling components. Unique configurations of these components of the ISS-INHCI exist for all Release-B sites (GSFC, LaRC, EDC, JPL, NSIDC, ORNL, ASF DAACs; SMC; and the EOC).

4.10.3 Requirements Table

The following table lists all ISS L4 requirements for Releases Ir1, A & B in numerical order together with their RbR parent requirements.

Internetworking Subsystem L4 to RbR traceability (1 of 61)

L4 ID	Rel	L4 Text	RbR ID	RbR Text
C-HRD-31000	A	The ISS shall provide LANs at the following Release A sites: a. GSFC DAAC LAN b. GSFC EOC LAN c. EDC DAAC LAN d. LaRC DAAC LAN e. MSFC DAAC LAN f. GSFC SMC LAN	ESN-1350#A	The ESN LANs shall provide physical devices and the corresponding medium access control (MAC) protocol compatible with ISO and ANSI standards.
			EOSD0500#A	ECS shall perform the following major functions: a. EOS Mission Planning and Scheduling b. EOS Mission Operations c. Command and Control d. Communications and Networking e. Data Input f. Data Processing g. Data Storage h. Data Distribution i. Information Management j. End-to-End Fault Management k. System Management
C-HRD-32000	IR1	The ISS shall use physical devices and Medium Access Control protocols compatible with the following standards: a. IEEE 802.2 (Logical Link Control) b. IEEE 802.3 (MAC for Ethernet) c. IEEE 802.6 (MAC for SMDS) d. ANSI X3T9.5 (MAC for FDDI).	ESN-1350#A	The ESN LANs shall provide physical devices and the corresponding medium access control (MAC) protocol compatible with ISO and ANSI standards.
			ESN-1350#Ir1	The ESN LANs shall provide physical devices and the corresponding medium access control (MAC) protocol compatible with ISO and ANSI standards.

Internetworking Subsystem L4 to RbR traceability

L4 ID	Rel	L4 Text	RbR ID	RbR Text
C-HRD-32010	IR1	The ISS physical components, and services shall have the capability to be monitored via SNMP agents.	ESN-0010#Ir1	ESN shall provide the following standard services: a. Data Transfer and Management Services b. Electronic Messaging Service c. Remote Terminal Service d. Process to Process Communication Service e. Directory and User Access Control Service f. Network Management Service g. Network Security and Access Control Service h. Internetwork Interface Services
			ESN-0740#Ir1	The ESN network management service shall retrieve performance/fault data about ESN protocol stacks and equipment.
			ESN-0620#Ir1	The ESN shall include a network management function to monitor and control the ESN.
			ESN-0010#A	ESN shall provide the following standard services: a. Data Transfer and Management Services b. Electronic Messaging Service c. Remote Terminal Service d. Process to Process Communication Service e. Directory and User Access Control Service f. Network Management Service g. Network Security and Access Control Service h. Internetwork Interface Services i. Bulletin Board Service
			ESN-0780#A	The network elements including the Internet interfaces, shall have the capability to report, periodically and on an interactive basis , network statistics to the ESN network management function, including the following information: a. Network round trip delay b. Network reset and restart indications c. Outages and CRC errors d. Performance statistics
			ESN-0740#A	The ESN network management service shall retrieve performance/fault data about ESN protocol stacks and equipment.
			ESN-0620#A	The ESN shall include a network management function to monitor and control the ESN.

Internetworking Subsystem L4 to RbR traceability

L4 ID	Rel	L4 Text	RbR ID	RbR Text
C-HRD-34000	A	The LAN Analysis Equipment shall provide protocol analysis through the transport layer for all ISS LAN protocols and interconnection protocols to MANs/WANs.	ESN-1010#A	The ESN shall provide, for selective use as a debugging aid, the capability to perform packet tracing of its supported protocols.
C-HRD-34010	A	The LAN Analysis Equipment shall include: a. Communications line monitors to store and display up to 10,000 bytes of data sent and received over any of the communications lines at rates of 10MB/sec to 100MB/sec, and supporting the protocols used within and interconnecting ECS. b. Local Area Network analyzers	ESN-1010#A	The ESN shall provide, for selective use as a debugging aid, the capability to perform packet tracing of its supported protocols.
C-HRD-36000	A	The EOC LAN loop delay contribution shall not exceed more than 500 msec (goal 250 msec) seconds of the total ECS delay of 2.5 seconds for emergency real-time commands.	AM1-1150#A	ECS shall contribute a loop delay of not greater than 2.5 seconds of the total system delay of five (5) seconds for emergency real-time commands, not including the time needed for command execution. The loop delay is measured from the originator to the spacecraft/instrument and back and only applies when a Tracking and Data Relay Satellite System (TDRSS) link is available for contact to the spacecraft.
			EOSD1000#A	ECS elements shall contribute a loop delay of not greater than 2.5 seconds of the total system delay of five (5) seconds for emergency real-time commands, not including the time needed for command execution. The loop delay is measured from the originator to the spacecraft/instrument and back and only applies when a Tracking and Data Relay Satellite System (TDRSS) link is available for contact to the spacecraft.
C-HRD-36010	A	The EOC Operational LAN backbone shall be able to support a peak traffic rate of 24 Mbps to support AM-1 flows from the Ecom interface.	EOSD1010#A	ECS shall support daily data volume, processing load, storage volume, instrument support, and data traffic as derivable from and specified in Appendix C and D.

Internetworking Subsystem L4 to RbR traceability

L4 ID	Rel	L4 Text	RbR ID	RbR Text
			AM1-1050#A	The EOC shall support several uplink rates to the spacecraft, which include at a minimum the following: a. 10 kilobits per second (kbps) (SSA uplink) b. 1 kbps (S-band MA uplink) c. 125 bits per second (bps) (SSA uplink during contingency operations) d. 2 kbps (emergency operations via S-band DSN link)
			AM1-1070#A	The EOC shall provide the capability to receive and process real-time data received as two 16 kbps data streams.
			EDOS-A.2.1#A	The DIF-EOC interface shall provide the capability to support the transfer of real-time return link EDUs to the EOC at a rate of up to 1.1 Mbps.
			ESN-1206#A	The ESN capacity and performance shall be consistent with the specified capacity and performance requirements of the ECS functions.
			ESN-1207#A	The ESN capacity and performance shall be capable of expansion to be consistent with the specified capacity and performance growth requirements of the ECS elements and functions.
C-HRD-36020	A	The ISS shall provide wide area bandwidth necessary to support data transfer in accordance with Release A requirements specified in "Communications Requirements for the ECS Project", 194-220-SE3-001.	ESN-0005#A	The ESN internal networks shall be dedicated networks linking ECS facilities for internal ECS operations (e.g., scheduling, product generation, QA validation).
			ESN-0080#A	The ESN shall provide internal communications interfaces to GFE circuits provided by PSCN which link to: a. Specified ADCs b. Selected SCFs c. Selected EPDSs (Landsat-7, TRMM) d. Selected ISTs

Internetworking Subsystem L4 to RbR traceability

L4 ID	Rel	L4 Text	RbR ID	RbR Text
C-HRD-36030	A	The ISS shall provide sufficient local area network bandwidth at the LaRC DAAC to support data transfer between and among physical nodes provided by SDPS, MSS and CSS in accordance with the Release A network I/O sizing listed in Appendix A of the current version of 304-CD-003.	ESN-0070#A	The ESN shall support the elements data flow requirements identified in this specification.
			EOSD1010#A	ECS shall support daily data volume, processing load, storage volume, instrument support, and data traffic as derivable from and specified in Appendix C and D.
			EDOS-B.2.1#A	The DIF-LaRC DAAC interface shall provide the capability to support the transfer of Operations Management data to the LaRC DAAC at a rate of up to 50 Kbps.
C-HRD-36040	A	The ISS shall provide sufficient local area network bandwidth at the MSFC DAAC to support data transfer between and among physical nodes provided by SDPS, MSS and CSS in accordance with the Release A network I/O sizing listed in Appendix A of the current version of 304-CD-003.	EOSD1010#A	ECS shall support daily data volume, processing load, storage volume, instrument support, and data traffic as derivable from and specified in Appendix C and D.
			ESN-0070#A	The ESN shall support the elements data flow requirements identified in this specification.
C-HRD-36050	A	The ISS shall provide sufficient local area network bandwidth at the GSFC DAAC to support data transfer between and among physical nodes provided by SDPS, MSS and CSS in accordance with the Release A network I/O sizing listed in Appendix A of the current version of 304-CD-003.	ESN-0070#A	The ESN shall support the elements data flow requirements identified in this specification.

Internetworking Subsystem L4 to RbR traceability

L4 ID	Rel	L4 Text	RbR ID	RbR Text
			EOSD1010#A	ECS shall support daily data volume, processing load, storage volume, instrument support, and data traffic as derivable from and specified in Appendix C and D.
			EDOS-C.2.1#A	The DIF-GSFC DAAC interface shall provide the capability to support the transfer of Operations Management data to the GSFC DAAC at a rate of up to 50 Kbps.
C-HRD-36060	A	The ISS shall provide sufficient local area network bandwidth at the EDC DAAC to support data transfer between and among physical nodes provided by SDPS, MSS and CSS in accordance with the Release A network sizing listed in Appendix A of the current version of 304-CD-003.	EOSD1010#A	ECS shall support daily data volume, processing load, storage volume, instrument support, and data traffic as derivable from and specified in Appendix C and D.
C-HRD-36065	A	The ISS shall reuse the existing V0 DAAC LAN at EDC for Release A.	ESN-0010#A	ESN shall provide the following standard services: a. Data Transfer and Management Services b. Electronic Messaging Service c. Remote Terminal Service d. Process to Process Communication Service e. Directory and User Access Control Service f. Network Management Service g. Network Security and Access Control Service h. Internetwork Interface Services i. Bulletin Board Service
			ESN-0070#A	The ESN shall support the elements data flow requirements identified in this specification.
C-HRD-36070	A	The ISS LANs at the GSFC, MSFC and LaRC DAAC sites shall be capable of supporting twice the R-A network traffic load estimates without redesign.	ESN-0240#A	The ESN shall be extensible in its design to provide capability for growth and enhancement.
			EOSD1040#A	ECS shall provide sufficient capacity to permit the reprocessing of all EOS science data at twice the incoming data rate at a minimum, concurrently with processing of new data.

Internetworking Subsystem L4 to RbR traceability

L4 ID	Rel	L4 Text	RbR ID	RbR Text
C-HRD-36080	A	The ISS LANs at the Release-A DAAC sites shall be designed in a manner that allows a. Nodes to be added to any given LAN segment. b. Additional LAN segments to be added to the LAN.	ESN-1206#A	The ESN capacity and performance shall be consistent with the specified capacity and performance requirements of the ECS functions.
			ESN-0240#A	The ESN shall be extensible in its design to provide capability for growth and enhancement.
			ESN-1207#A	The ESN capacity and performance shall be capable of expansion to be consistent with the specified capacity and performance growth requirements of the ECS elements and functions.
C-HRD-36090	A	The EOC Operational LAN shall be able to support 230 network devices without redesign.	ESN-1206#A	The ESN capacity and performance shall be consistent with the specified capacity and performance requirements of the ECS functions.
			ESN-1207#A	The ESN capacity and performance shall be capable of expansion to be consistent with the specified capacity and performance growth requirements of the ECS elements and functions.
C-HRD-36100	A	The EOC Operational LAN shall be able to support peak data rates of up to 48 Mbps without redesign.	EOSD1040#A	ECS shall provide sufficient capacity to permit the reprocessing of all EOS science data at twice the incoming data rate at a minimum, concurrently with processing of new data.
C-HRD-37000	A	The ISS networks shall support the use of network and transport layer filtering to control access from internal and external interfaces.	EOSD1990#A	The ECS system and elements shall employ security measures and techniques for all applicable security disciplines which are identified in the preceding documents. These documents shall provide the basis for the ECS security policy.

Internetworking Subsystem L4 to RbR traceability

L4 ID	Rel	L4 Text	RbR ID	RbR Text
			EOSD2100#A	The ECS technical security policy planning shall be comprehensive and shall cover at least the following areas: a. Applicability of the C2 Level of Trustedness as defined by the NSA b. Applicability of the C2 Object Reuse capability c. Discretionary control and monitoring of user access d. ECS communications, network access, control, and monitoring e. Computer system "virus" monitoring, detection, and remedy f. Data protection controls g. Account/privilege management and user session tailoring h. Restart/recovery i. Security audit trail generation j. Security analysis and reporting k. Risk analysis
C-HRD-39000	A	The ISS-INHCI DAAC LANs shall provide transparent portability across heterogeneous site LAN architectures.	EOSD5000#A	ECS shall enable the addition of other data providers, e.g. DAACs, SCFs, ADCs, ODCs, which may: - provide heterogeneous services, i.e. services in support of EOS which may be less than or different than ECS services. - be connected with varying topologies - have variable levels of reliability or operational availability.
			EOSD5020#A	ECS software, hardware, and interfaces shall enable transparent portability across heterogeneous site architectures, i.e. performing the same function at different ECS sites that may have different hardware implementations.
C-HRD-39005	A	The ISS-INHCI DAAC LANs shall enable expansion to GByte networks including the ability to provide increased volume of data distribution and access.	EOSD5070#A	ECS shall enable expansion to GByte networks including the ability to provide increased volume of data distribution/access..
			SMC-2510#A	The SMC shall provide at a minimum system-wide configuration management for the operational hardware, scientific and system software, and the SMC toolkit contained within ECS. The management system shall support the migration of hardware and software upgrades into the operational environment.
C-ISS-01000	IR1	The ISS shall interoperate with the V0 Wide Area Network to provide IR-1 connectivity as specified in DID 220, "Communications Requirements for the ECS project".	ESN-0003#Ir1	The ESN shall enable researchers on existing networks (TCP/IP and GOSIP) to gain access to data and ECS services in a transparent manner to the underlying differences between the networks.

Internetworking Subsystem L4 to RbR traceability

L4 ID	Rel	L4 Text	RbR ID	RbR Text
			ESN-1140#Ir1	The ESN shall provide protocol translation, termination, bridging and routing.
			ESN-0005#B	The ESN internal networks shall be dedicated networks linking ECS facilities for internal ECS operations (e.g., scheduling, product generation, QA validation).
			ESN-0080#B	The ESN shall provide internal communications interfaces to GFE circuits provided by PSCN which link to: a. Specified ADCs b. Selected SCFs c. Selected EPDSs (Landsat-7, TRMM) d. Selected ISTs
			ESN-0005#A	The ESN internal networks shall be dedicated networks linking ECS facilities for internal ECS operations (e.g., scheduling, product generation, QA validation).
			ESN-0080#A	The ESN shall provide internal communications interfaces to GFE circuits provided by PSCN which link to: a. Specified ADCs b. Selected SCFs c. Selected EPDSs (Landsat-7, TRMM) d. Selected ISTs
			V0-0055#A	Version 0 shall permit ECS to use agreed upon Version 0 network components and services.
			V0-0055#B	Version 0 shall permit ECS to use agreed upon Version 0 network components and services.
C-ISS-01010	IR1	The ISS shall provide an interface between the V0 WAN and the MSFC, LaRC and GSFC DAACs for the purpose of IR-1 interface testing.	V0-0055#A	Version 0 shall permit ECS to use agreed upon Version 0 network components and services.
			V0-0055#B	Version 0 shall permit ECS to use agreed upon Version 0 network components and services.

Internetworking Subsystem L4 to RbR traceability

L4 ID	Rel	L4 Text	RbR ID	RbR Text
			ESN-0010#A	ESN shall provide the following standard services: a. Data Transfer and Management Services b. Electronic Messaging Service c. Remote Terminal Service d. Process to Process Communication Service e. Directory and User Access Control Service f. Network Management Service g. Network Security and Access Control Service h. Internetwork Interface Services i. Bulletin Board Service
			ESN-0070#A	The ESN shall support the elements data flow requirements identified in this specification.
			ESN-0010#B	ESN shall provide the following standard services: a. Data Transfer and Management Services b. Electronic Messaging Service c. Remote Terminal Service d. Process to Process Communication Service e. Directory and User Access Control Service f. Network Management Service g. Network Security and Access Control Service h. Internetwork Interface Services i. Bulletin Board Service
			ESN-0070#B	The ESN shall support the elements data flow requirements identified in this specification.
			ESN-0010#Ir1	ESN shall provide the following standard services: a. Data Transfer and Management Services b. Electronic Messaging Service c. Remote Terminal Service d. Process to Process Communication Service e. Directory and User Access Control Service f. Network Management Service g. Network Security and Access Control Service h. Internetwork Interface Services
			ESN-0070#Ir1	The ESN shall support the elements data flow requirements identified in this specification.

Internetworking Subsystem L4 to RbR traceability

L4 ID	Rel	L4 Text	RbR ID	RbR Text
C-ISS-01020	IR1	The ISS shall interface with NSI or an alternate Internet provider at GSFC, MSFC, LaRC and EDC to provide DAAC access to science users in accordance with the following documents: a. DID 220, "Communications Requirements for the ECS Project" 194-220-SE3-001 b. Interface Requirements Document between EOSDIS Core System (ECS) and the NASA Science Internet (NSI), 194-219-SE1-001	ESN-0006#Ir1	ESN shall interface with NSI to reach all external non-ECS network-attached facilities and science users.
			ESN-0006#A	ESN shall interface with NSI to reach all external non-ECS network-attached facilities and science users.
C-ISS-01030	IR1	The ISS shall provide for connectivity between the MSFC DAAC and EBnet for the ingest of L0 LIS data.	ESN-0070#Ir1	The ESN shall support the elements data flow requirements identified in this specification.
			ESN-0010#Ir1	ESN shall provide the following standard services: a. Data Transfer and Management Services b. Electronic Messaging Service c. Remote Terminal Service d. Process to Process Communication Service e. Directory and User Access Control Service f. Network Management Service g. Network Security and Access Control Service h. Internetwork Interface Services
			ESN-0010#B	ESN shall provide the following standard services: a. Data Transfer and Management Services b. Electronic Messaging Service c. Remote Terminal Service d. Process to Process Communication Service e. Directory and User Access Control Service f. Network Management Service g. Network Security and Access Control Service h. Internetwork Interface Services i. Bulletin Board Service

Internetworking Subsystem L4 to RbR traceability

L4 ID	Rel	L4 Text	RbR ID	RbR Text
			ESN-0070#B	The ESN shall support the elements data flow requirements identified in this specification.
			NI-0400#Ir1	ECS shall have the capability to interface with NASA Data Processing Facilities (including the GSFC SDPF) via NOLAN to receive the following data (at a minimum): a. Science data b. Ancillary data c. Orbit data
			NI-0400#B	ECS shall have the capability to interface with NASA Data Processing Facilities (including the GSFC SDPF) via NOLAN to receive the following data (at a minimum): a. Science data b. Ancillary data c. Orbit data
			NI-0400#A	ECS shall have the capability to interface with NASA Data Processing Facilities (including the GSFC SDPF) via NOLAN to receive the following data (at a minimum): a. Science data b. Ancillary data c. Orbit data
			ESN-0010#A	ESN shall provide the following standard services: a. Data Transfer and Management Services b. Electronic Messaging Service c. Remote Terminal Service d. Process to Process Communication Service e. Directory and User Access Control Service f. Network Management Service g. Network Security and Access Control Service h. Internetwork Interface Services i. Bulletin Board Service
			ESN-0070#A	The ESN shall support the elements data flow requirements identified in this specification.
			TRMM2010#A	The ECS systems at the MSFC DAAC shall ingest LIS data from SDPF.

Internetworking Subsystem L4 to RbR traceability

L4 ID	Rel	L4 Text	RbR ID	RbR Text
			TRMM2060#B	The ECS systems at the MSFC DAAC shall, after notification by SPDF, retrieve LIS Level 0 production and quick-look data by an agreed upon file transfer protocol.
			TRMM2060#A	The ECS systems at the MSFC DAAC shall, after notification by SPDF, retrieve LIS Level 0 production and quick-look data by an agreed upon file transfer protocol.
			TRMM2010#B	The ECS systems at the MSFC DAAC shall ingest LIS data from SDPF.
			TRMM2010#Ir1	The ECS systems at the MSFC DAAC shall ingest LIS data from SDPF.
C-ISS-01040	IR1	The ISS shall provide for connectivity between the LaRC DAAC and EBnet for the ingest of L0 CERES data.	TRMM1010#A	The ECS systems at the LaRC DAAC shall ingest CERES Level 0 and quick-look data from sets from SDPF.
			TRMM1010#Ir1	The ECS systems at the LaRC DAAC shall ingest CERES Level 0 and quick-look data sets from SDPF.
			TRMM1060#B	The ECS systems at the LaRC DAAC shall, after notification by SDPF, retrieve CERES Level 0 production by an agreed-upon file transfer protocol.
			TRMM1060#A	The ECS systems at the LaRC DAAC shall, after notification by SDPF, retrieve CERES Level 0 production by an agreed-upon file transfer protocol.
			TRMM1060#Ir1	The ECS systems at the LaRC DAAC shall, after notification by SDPF, retrieve CERES Level 0 production by an agreed-upon file transfer protocol.
			TRMM1010#B	The ECS systems at the LaRC DAAC shall ingest CERES Level 0 and quick-look data sets from SDPF.

Internetworking Subsystem L4 to RbR traceability

L4 ID	Rel	L4 Text	RbR ID	RbR Text
			ESN-0010#A	ESN shall provide the following standard services: a. Data Transfer and Management Services b. Electronic Messaging Service c. Remote Terminal Service d. Process to Process Communication Service e. Directory and User Access Control Service f. Network Management Service g. Network Security and Access Control Service h. Internetwork Interface Services i. Bulletin Board Service
			ESN-0070#A	The ESN shall support the elements data flow requirements identified in this specification.
			NI-0400#Ir1	ECS shall have the capability to interface with NASA Data Processing Facilities (including the GSFC SDPF) via NOLAN to receive the following data (at a minimum): a. Science data b. Ancillary data c. Orbit data
			NI-0400#A	ECS shall have the capability to interface with NASA Data Processing Facilities (including the GSFC SDPF) via NOLAN to receive the following data (at a minimum): a. Science data b. Ancillary data c. Orbit data
			NI-0400#B	ECS shall have the capability to interface with NASA Data Processing Facilities (including the GSFC SDPF) via NOLAN to receive the following data (at a minimum): a. Science data b. Ancillary data c. Orbit data

Internetworking Subsystem L4 to RbR traceability

L4 ID	Rel	L4 Text	RbR ID	RbR Text
			ESN-0010#B	ESN shall provide the following standard services: a. Data Transfer and Management Services b. Electronic Messaging Service c. Remote Terminal Service d. Process to Process Communication Service e. Directory and User Access Control Service f. Network Management Service g. Network Security and Access Control Service h. Internetwork Interface Services i. Bulletin Board Service
			ESN-0070#B	The ESN shall support the elements data flow requirements identified in this specification.
			ESN-0010#Ir1	ESN shall provide the following standard services: a. Data Transfer and Management Services b. Electronic Messaging Service c. Remote Terminal Service d. Process to Process Communication Service e. Directory and User Access Control Service f. Network Management Service g. Network Security and Access Control Service h. Internetwork Interface Services
			ESN-0070#Ir1	The ESN shall support the elements data flow requirements identified in this specification.
C-ISS-01080	IR1	The ISS shall reuse the V0 WAN in order to provide connectivity between V0 network nodes and V1 network nodes and to provide interoperability between the systems.	EOSD1695#A	The ECS shall provide 2-way interoperability with the V0 system.
			ESN-0007#A	The ESN shall restrict the use of ECS inter-DAAC wide area networks for data transmission between ECS DAACs and other facilities that are directly attached to the ECS external network.

Internetworking Subsystem L4 to RbR traceability

L4 ID	Rel	L4 Text	RbR ID	RbR Text
			ESN-0080#A	The ESN shall provide internal communications interfaces to GFE circuits provided by PSCN which link to: a. Specified ADCs b. Selected SCFs c. Selected EPDSs (Landsat-7, TRMM) d. Selected ISTs
			ESN-1140#A	The ESN shall provide protocol translation, termination, bridging and routing.
			V0-0055#A	Version 0 shall permit ECS to use agreed upon Version 0 network components and services.
			ESN-1140#Ir1	The ESN shall provide protocol translation, termination, bridging and routing.
C-ISS-01090	A	The ISS shall provide for local or metro area connectivity between V0 network nodes and V1 network nodes at GSFC, LaRC and MSFC DAAC sites in order to provide interoperability between the systems.	V0-0055#A	Version 0 shall permit ECS to use agreed upon Version 0 network components and services.
			ESN-0010#A	ESN shall provide the following standard services: a. Data Transfer and Management Services b. Electronic Messaging Service c. Remote Terminal Service d. Process to Process Communication Service e. Directory and User Access Control Service f. Network Management Service g. Network Security and Access Control Service h. Internetwork Interface Services i. Bulletin Board Service
			EOSD1695#A	The ECS shall provide 2-way interoperability with the V0 system.
C-ISS-01100	IR1	The ISS shall provide for connectivity with TSDIS in order to transfer TRMM data to the GSFC DAAC.	ESN-0070#A	The ESN shall support the elements data flow requirements identified in this specification.
			ESN-0070#B	The ESN shall support the elements data flow requirements identified in this specification.

Internetworking Subsystem L4 to RbR traceability

L4 ID	Rel	L4 Text	RbR ID	RbR Text
C-ISS-01110	A	The ISS shall provide for connectivity with TSDIS in order to transfer TRMM data to the MSFC DAAC via the EBnet.	ESN-0070#A	The ESN shall support the elements data flow requirements identified in this specification.
			TRMM3120#A	Communications between TSDIS and the ECS systems at the MSFC DAAC to transport the PR, TMI, and GV standard products, metadata, SSM/I ancillary data, algorithms, and documentation shall be provided by ESDIS.
C-ISS-01120	A	The ISS shall provide for connectivity to the MSFC campus network to enable transfer of data between SCF(s) located at MSFC and the MSFC DAAC.	ESN-0010#A	ESN shall provide the following standard services: a. Data Transfer and Management Services b. Electronic Messaging Service c. Remote Terminal Service d. Process to Process Communication Service e. Directory and User Access Control Service f. Network Management Service g. Network Security and Access Control Service h. Internetwork Interface Services i. Bulletin Board Service
			ESN-0070#A	The ESN shall support the elements data flow requirements identified in this specification.
			ESN-0010#B	ESN shall provide the following standard services: a. Data Transfer and Management Services b. Electronic Messaging Service c. Remote Terminal Service d. Process to Process Communication Service e. Directory and User Access Control Service f. Network Management Service g. Network Security and Access Control Service h. Internetwork Interface Services i. Bulletin Board Service
			ESN-0070#B	The ESN shall support the elements data flow requirements identified in this specification.

Internetworking Subsystem L4 to RbR traceability

L4 ID	Rel	L4 Text	RbR ID	RbR Text
C-ISS-01130	A	The ISS shall provide for connectivity to the LaRC campus network to enable transfer of data between SCF(s) located at LaRC and the LaRC DAAC.	ESN-0010#B	ESN shall provide the following standard services: a. Data Transfer and Management Services b. Electronic Messaging Service c. Remote Terminal Service d. Process to Process Communication Service e. Directory and User Access Control Service f. Network Management Service g. Network Security and Access Control Service h. Internetwork Interface Services i. Bulletin Board Service
			ESN-0070#B	The ESN shall support the elements data flow requirements identified in this specification.
			ESN-0010#A	ESN shall provide the following standard services: a. Data Transfer and Management Services b. Electronic Messaging Service c. Remote Terminal Service d. Process to Process Communication Service e. Directory and User Access Control Service f. Network Management Service g. Network Security and Access Control Service h. Internetwork Interface Services i. Bulletin Board Service
			ESN-0070#A	The ESN shall support the elements data flow requirements identified in this specification.
C-ISS-01140	A	The ISS shall provide for connectivity to the GSFC campus network to enable transfer of data between SCF(s) located at GSFC and the GSFC DAAC.	ESN-0010#A	ESN shall provide the following standard services: a. Data Transfer and Management Services b. Electronic Messaging Service c. Remote Terminal Service d. Process to Process Communication Service e. Directory and User Access Control Service f. Network Management Service g. Network Security and Access Control Service h. Internetwork Interface Services i. Bulletin Board Service
			ESN-0070#A	The ESN shall support the elements data flow requirements identified in this specification.

Internetworking Subsystem L4 to RbR traceability

L4 ID	Rel	L4 Text	RbR ID	RbR Text
			ESN-0010#B	ESN shall provide the following standard services: a. Data Transfer and Management Services b. Electronic Messaging Service c. Remote Terminal Service d. Process to Process Communication Service e. Directory and User Access Control Service f. Network Management Service g. Network Security and Access Control Service h. Internetwork Interface Services i. Bulletin Board Service
			ESN-0070#B	The ESN shall support the elements data flow requirements identified in this specification.
C-ISS-01150	A	The ISS shall provide for connectivity between the Landsat system and the EDC DAAC to support the ingest of Landsat data.	ESN-0010#B	ESN shall provide the following standard services: a. Data Transfer and Management Services b. Electronic Messaging Service c. Remote Terminal Service d. Process to Process Communication Service e. Directory and User Access Control Service f. Network Management Service g. Network Security and Access Control Service h. Internetwork Interface Services i. Bulletin Board Service
			ESN-0070#B	The ESN shall support the elements data flow requirements identified in this specification.
			ESN-0010#A	ESN shall provide the following standard services: a. Data Transfer and Management Services b. Electronic Messaging Service c. Remote Terminal Service d. Process to Process Communication Service e. Directory and User Access Control Service f. Network Management Service g. Network Security and Access Control Service h. Internetwork Interface Services i. Bulletin Board Service
			ESN-0070#A	The ESN shall support the elements data flow requirements identified in this specification.

Internetworking Subsystem L4 to RbR traceability

L4 ID	Rel	L4 Text	RbR ID	RbR Text
C-ISS-01170	A	The ISS shall provide for connectivity between the EOC and EBnet for AM-1 interface testing.	NI-0110#A	ECS shall have the capability to communicate with the NCC via the Ecom interface.
			NI-0210#A	ECS shall have the capability to communicate with the GN, DSN, and WOTS via the EDOS/Ecom interface.
			NI-0310-a#A	ECS shall have the capability to communicate with the FDF via the Ecom interface (FOS and CSMS only).
			ESN-0010#A	ESN shall provide the following standard services: a. Data Transfer and Management Services b. Electronic Messaging Service c. Remote Terminal Service d. Process to Process Communication Service e. Directory and User Access Control Service f. Network Management Service g. Network Security and Access Control Service h. Internetwork Interface Services i. Bulletin Board Service
			ESN-0070#A	The ESN shall support the elements data flow requirements identified in this specification.
C-ISS-01180	A	The ISS shall provide for connectivity between the EOC and EBnet for AM-1 interface testing of EOC/IST communications.	ESN-0010#A	ESN shall provide the following standard services: a. Data Transfer and Management Services b. Electronic Messaging Service c. Remote Terminal Service d. Process to Process Communication Service e. Directory and User Access Control Service f. Network Management Service g. Network Security and Access Control Service h. Internetwork Interface Services i. Bulletin Board Service
			ESN-0070#A	The ESN shall support the elements data flow requirements identified in this specification.

Internetworking Subsystem L4 to RbR traceability

L4 ID	Rel	L4 Text	RbR ID	RbR Text
C-ISS-01185	A	The ISS shall provide for connectivity to the designated international partner (IP) pickup point for ASTER.	ESN-0180#A	The ESN shall connect with the International partners designated pickup points.
			ASTER-0950#B	ECS shall have the capability to send and ASTER GDS shall have the capability to receive ancillary data, including associated metadata.
			ESN-0180#B	The ESN shall connect with the International partners designated pickup points.
C-ISS-01190	A	The ISS shall provide LAN connectivity and OSI Layer 1 through 4 services between EOC components (in support of FOS interface testing at Release A).	ESN-0010#A	ESN shall provide the following standard services: a. Data Transfer and Management Services b. Electronic Messaging Service c. Remote Terminal Service d. Process to Process Communication Service e. Directory and User Access Control Service f. Network Management Service g. Network Security and Access Control Service h. Internetwork Interface Services i. Bulletin Board Service
			ESN-0070#A	The ESN shall support the elements data flow requirements identified in this specification.
			ESN-0010#B	ESN shall provide the following standard services: a. Data Transfer and Management Services b. Electronic Messaging Service c. Remote Terminal Service d. Process to Process Communication Service e. Directory and User Access Control Service f. Network Management Service g. Network Security and Access Control Service h. Internetwork Interface Services i. Bulletin Board Service
			ESN-0070#B	The ESN shall support the elements data flow requirements identified in this specification.

Internetworking Subsystem L4 to RbR traceability

L4 ID	Rel	L4 Text	RbR ID	RbR Text
C-ISS-01195	A	The ISS shall provide for connectivity with Ecom at the following ECS sites: a. GSFC DAAC b. GSFC EOC c. LaRC DAAC d. MSF DAAC	EOSD0010#A	ECS shall use and support the Space Network (SN), via the EDOS/Ecom interface, to obtain the forward and return link data communications needed to achieve full end-to-end ECS functionality.
			EOSD0015#A	ECS shall use and support the Deep Space Network (DSN), the Ground Network (GN), and the Wallops Orbital Tracking Station (WOTS), via the EDOS/Ecom/Nascom interface, as backup of the SN, to obtain forward and return link data communications.
			NI-0010#A	ECS shall have the capability to communicate with the TDRSS via the EDOS/Ecom interface.
			NI-0020#A	ECS shall have the capability to communicate with the TDRSS for transmitting commands to EOS spacecraft (via the EDOS/Ecom interface). Mission-specific requirements for supporting EOS spacecraft command operations will be documented in the EOS mission-level Detailed Mission Requirements documents.
			NI-0220#A	ECS shall have the capability to communicate with the GN, DSN, and WOTS for transmitting commands to EOS spacecraft (via the EDOS/Ecom interface). Mission-specific requirements for supporting EOS spacecraft command operations will be documented in the EOS mission-level Detailed Mission Requirements documents.
			NI-0230#A	ECS shall have the capability to interface with the GN, DSN, and WOTS for obtaining return link (telemetry) data from EOS spacecraft (via the EDOS/Ecom interface). Mission-specific requirements for supporting EOS spacecraft telemetry operations will be documented in the EOS mission-level Detailed Mission Requirements documents.
			NI-0030#A	ECS shall have the capability to interface with the TDRSS for obtaining return link (telemetry) data from EOS spacecraft (via the EDOS/Ecom interface). Mission-specific requirements for supporting EOS spacecraft telemetry operations will be documented in the EOS mission Detailed Mission Requirements documents.

Internetworking Subsystem L4 to RbR traceability

L4 ID	Rel	L4 Text	RbR ID	RbR Text
C-ISS-01200	A	The topology of the EOC LANs shall not inhibit the reconfiguration of FOS devices to support either operational or support functions.	ESN-0070#B	The ESN shall support the elements data flow requirements identified in this specification.
			ESN-0070#A	The ESN shall support the elements data flow requirements identified in this specification.
C-ISS-01210	A	The ISS shall provide the EOC with a separate network to support functions that will not interfere with the EOC's operational LAN.	FOS-0020#A	The FOS shall provide a training mode of operation for use during operator training and/or user training that does not interfere with ongoing operations.
			FOS-0025#A	The FOS shall provide a test mode of operation that does not interfere with ongoing operations, and which supports independent element and subsystem tests, end-to∞ end tests, and integration and verification activities occurring during at a minimum: a. Spacecraft and instrument integration and test b. Pre-launch c. Upgrades and enhancements
			FOS-0020#B	The FOS shall provide a training mode of operation for use during operator training and/or user training that does not interfere with ongoing operations.
			FOS-0025#B	The FOS shall provide a test mode of operation that does not interfere with ongoing operations, and which supports independent element and subsystem tests, end-to∞ end tests, and integration and verification activities occurring during at a minimum: a. Spacecraft and instrument integration and test b. Pre-launch c. Upgrades and enhancements
C-ISS-01215	A	The EOC's support LAN architecture shall be identical in function and performance to that of the operational network.	FOS-0020#B	The FOS shall provide a training mode of operation for use during operator training and/or user training that does not interfere with ongoing operations.
			FOS-0025#B	The FOS shall provide a test mode of operation that does not interfere with ongoing operations, and which supports independent element and subsystem tests, end-to∞ end tests, and integration and verification activities occurring during at a minimum: a. Spacecraft and instrument integration and test b. Pre-launch c. Upgrades and enhancements

Internetworking Subsystem L4 to RbR traceability

L4 ID	Rel	L4 Text	RbR ID	RbR Text
			FOS-0020#A	The FOS shall provide a training mode of operation for use during operator training and/or user training that does not interfere with ongoing operations.
			FOS-0025#A	The FOS shall provide a test mode of operation that does not interfere with ongoing operations, and which supports independent element and subsystem tests, end-to∞ end tests, and integration and verification activities occurring during at a minimum: a. Spacecraft and instrument integration and test b. Pre-launch c. Upgrades and enhancements
C-ISS-01220	A	The ISS shall provide LAN connectivity and OSI Layer 1 through 4 (i.e.. from the physical to the transport layer) services between SDPS components at the GSFC DAAC.	ESN-0010#A	ESN shall provide the following standard services: a. Data Transfer and Management Services b. Electronic Messaging Service c. Remote Terminal Service d. Process to Process Communication Service e. Directory and User Access Control Service f. Network Management Service g. Network Security and Access Control Service h. Internetwork Interface Services i. Bulletin Board Service
			ESN-0070#A	The ESN shall support the elements data flow requirements identified in this specification.
C-ISS-01230	A	The ISS shall provide LAN connectivity and OSI Layer 1 through 4 (i.e.. from the physical to the transport layer) services between SDPS components at the LaRC DAAC.	ESN-0010#A	ESN shall provide the following standard services: a. Data Transfer and Management Services b. Electronic Messaging Service c. Remote Terminal Service d. Process to Process Communication Service e. Directory and User Access Control Service f. Network Management Service g. Network Security and Access Control Service h. Internetwork Interface Services i. Bulletin Board Service
			ESN-0070#A	The ESN shall support the elements data flow requirements identified in this specification.

Internetworking Subsystem L4 to RbR traceability

L4 ID	Rel	L4 Text	RbR ID	RbR Text
C-ISS-01240	A	The ISS shall provide LAN connectivity and OSI Layer 1 through 4 (i.e.. from the physical to the transport layer) services between SDPS components at the EDC DAAC.	ESN-0010#A	ESN shall provide the following standard services: a. Data Transfer and Management Services b. Electronic Messaging Service c. Remote Terminal Service d. Process to Process Communication Service e. Directory and User Access Control Service f. Network Management Service g. Network Security and Access Control Service h. Internetwork Interface Services i. Bulletin Board Service
			ESN-0070#A	The ESN shall support the elements data flow requirements identified in this specification.
C-ISS-01250	A	The ISS shall provide LAN connectivity and OSI Layer 1 through 4 (i.e.. from the physical to the transport layer) services between SDPS components at the MSFC DAAC.	ESN-0010#A	ESN shall provide the following standard services: a. Data Transfer and Management Services b. Electronic Messaging Service c. Remote Terminal Service d. Process to Process Communication Service e. Directory and User Access Control Service f. Network Management Service g. Network Security and Access Control Service h. Internetwork Interface Services i. Bulletin Board Service
			ESN-0070#A	The ESN shall support the elements data flow requirements identified in this specification.
C-ISS-01255	A	The ISS shall provide LAN connectivity and OSI Layer 1 through 4 (i.e., from the physical to the transport layer) services between CSMS components at the GSFC DAAC.	ESN-0010#A	ESN shall provide the following standard services: a. Data Transfer and Management Services b. Electronic Messaging Service c. Remote Terminal Service d. Process to Process Communication Service e. Directory and User Access Control Service f. Network Management Service g. Network Security and Access Control Service h. Internetwork Interface Services i. Bulletin Board Service
			ESN-0070#A	The ESN shall support the elements data flow requirements identified in this specification.

Internetworking Subsystem L4 to RbR traceability

L4 ID	Rel	L4 Text	RbR ID	RbR Text
C-ISS-01256	A	The ISS shall provide LAN connectivity and OSI Layer 1 through 4 services between the CSMS components at the EDC DAAC.	ESN-0010#A	ESN shall provide the following standard services: a. Data Transfer and Management Services b. Electronic Messaging Service c. Remote Terminal Service d. Process to Process Communication Service e. Directory and User Access Control Service f. Network Management Service g. Network Security and Access Control Service h. Internetwork Interface Services i. Bulletin Board Service
			ESN-0070#A	The ESN shall support the elements data flow requirements identified in this specification.
			ESN-0010#B	ESN shall provide the following standard services: a. Data Transfer and Management Services b. Electronic Messaging Service c. Remote Terminal Service d. Process to Process Communication Service e. Directory and User Access Control Service f. Network Management Service g. Network Security and Access Control Service h. Internetwork Interface Services i. Bulletin Board Service
			ESN-0070#B	The ESN shall support the elements data flow requirements identified in this specification.
C-ISS-01260	A	The ISS shall provide LAN connectivity and OSI Layer 1 through 4 (i.e., from the physical to the transport layer) services between CSMS components at the SMC.	ESN-0010#A	ESN shall provide the following standard services: a. Data Transfer and Management Services b. Electronic Messaging Service c. Remote Terminal Service d. Process to Process Communication Service e. Directory and User Access Control Service f. Network Management Service g. Network Security and Access Control Service h. Internetwork Interface Services i. Bulletin Board Service
			ESN-0070#A	The ESN shall support the elements data flow requirements identified in this specification.

Internetworking Subsystem L4 to RbR traceability

L4 ID	Rel	L4 Text	RbR ID	RbR Text
C-ISS-01270	A	The ISS shall provide LAN connectivity and OSI Layer 1 through 4 (i.e., from the physical to the transport layer) services between the SMC and the GSFC DAAC.	ESN-0010#A	ESN shall provide the following standard services: a. Data Transfer and Management Services b. Electronic Messaging Service c. Remote Terminal Service d. Process to Process Communication Service e. Directory and User Access Control Service f. Network Management Service g. Network Security and Access Control Service h. Internetwork Interface Services i. Bulletin Board Service
			ESN-0070#A	The ESN shall support the elements data flow requirements identified in this specification.
			ESN-0010#B	ESN shall provide the following standard services: a. Data Transfer and Management Services b. Electronic Messaging Service c. Remote Terminal Service d. Process to Process Communication Service e. Directory and User Access Control Service f. Network Management Service g. Network Security and Access Control Service h. Internetwork Interface Services i. Bulletin Board Service
			ESN-0070#B	The ESN shall support the elements data flow requirements identified in this specification.
C-ISS-01280	A	The ISS shall provide LAN connectivity and OSI Layer 1 through 4 (i.e., from the physical to the transport layer) services between the SMC and the EOC.	ESN-0010#B	ESN shall provide the following standard services: a. Data Transfer and Management Services b. Electronic Messaging Service c. Remote Terminal Service d. Process to Process Communication Service e. Directory and User Access Control Service f. Network Management Service g. Network Security and Access Control Service h. Internetwork Interface Services i. Bulletin Board Service
			ESN-0070#B	The ESN shall support the elements data flow requirements identified in this specification.

Internetworking Subsystem L4 to RbR traceability

L4 ID	Rel	L4 Text	RbR ID	RbR Text
			ESN-0010#A	ESN shall provide the following standard services: a. Data Transfer and Management Services b. Electronic Messaging Service c. Remote Terminal Service d. Process to Process Communication Service e. Directory and User Access Control Service f. Network Management Service g. Network Security and Access Control Service h. Internetwork Interface Services i. Bulletin Board Service
			ESN-0070#A	The ESN shall support the elements data flow requirements identified in this specification.
C-ISS-01290	A	The ISS shall provide LAN connectivity and OSI Layer 1 through 4 (i.e., from the physical to the transport layer) services between the FOS EOC components and the CSMS∞ provided LSM within the EOC.	ESN-0010#A	ESN shall provide the following standard services: a. Data Transfer and Management Services b. Electronic Messaging Service c. Remote Terminal Service d. Process to Process Communication Service e. Directory and User Access Control Service f. Network Management Service g. Network Security and Access Control Service h. Internetwork Interface Services i. Bulletin Board Service
			ESN-0070#A	The ESN shall support the elements data flow requirements identified in this specification.
C-ISS-01300	A	The ISS shall provide LAN connectivity and OSI Layer 1 through 4 (i.e., from the physical to the transport layer) services between the CSMS and the SDPS components at the MSFC DAAC.	ESN-0010#A	ESN shall provide the following standard services: a. Data Transfer and Management Services b. Electronic Messaging Service c. Remote Terminal Service d. Process to Process Communication Service e. Directory and User Access Control Service f. Network Management Service g. Network Security and Access Control Service h. Internetwork Interface Services i. Bulletin Board Service
			ESN-0070#A	The ESN shall support the elements data flow requirements identified in this specification.

Internetworking Subsystem L4 to RbR traceability

L4 ID	Rel	L4 Text	RbR ID	RbR Text
C-ISS-01310	A	The ISS shall provide LAN connectivity and OSI Layer 1 through 4 (i.e., from the physical to the transport layer) services between CSMS components at the MSFC DAAC.	ESN-0010#A	ESN shall provide the following standard services: a. Data Transfer and Management Services b. Electronic Messaging Service c. Remote Terminal Service d. Process to Process Communication Service e. Directory and User Access Control Service f. Network Management Service g. Network Security and Access Control Service h. Internetwork Interface Services i. Bulletin Board Service
			ESN-0070#A	The ESN shall support the elements data flow requirements identified in this specification.
C-ISS-01330	A	The ISS shall provide LAN connectivity and OSI Layer 1 through 4 (i.e., from the physical to the transport layer) services between CSMS components at the LaRC DAAC.	ESN-0010#A	ESN shall provide the following standard services: a. Data Transfer and Management Services b. Electronic Messaging Service c. Remote Terminal Service d. Process to Process Communication Service e. Directory and User Access Control Service f. Network Management Service g. Network Security and Access Control Service h. Internetwork Interface Services i. Bulletin Board Service
			ESN-0070#A	The ESN shall support the elements data flow requirements identified in this specification.
C-ISS-01340	A	The ISS shall provide LAN connectivity and OSI Layer 1 through 4 (i.e., from the physical to the transport layer) services between CSMS and SDPS components at the LaRC DAAC.	ESN-0010#A	ESN shall provide the following standard services: a. Data Transfer and Management Services b. Electronic Messaging Service c. Remote Terminal Service d. Process to Process Communication Service e. Directory and User Access Control Service f. Network Management Service g. Network Security and Access Control Service h. Internetwork Interface Services i. Bulletin Board Service
			ESN-0070#A	The ESN shall support the elements data flow requirements identified in this specification.

Internetworking Subsystem L4 to RbR traceability

L4 ID	Rel	L4 Text	RbR ID	RbR Text
C-ISS-02000	IR1	The ISS shall provide connection oriented transport services as specified by the TCP protocol referenced in RFC 793.	ESN-1340#Ir1	The ESN shall provide support for TCP/IP communications protocols and services to external interfaces as required by the IRDs.
			ESN-0003#Ir1	The ESN shall enable researchers on existing networks (TCP/IP and GOSIP) to gain access to data and ECS services in a transparent manner to the underlying differences between the networks.
			ESN-0003#B	The ESN shall enable researchers on existing networks (TCP/IP and GOSIP) to gain access to data and ECS services in a transparent manner to the underlying differences between the networks.
			ESN-0003#A	The ESN shall enable researchers on existing networks (TCP/IP and GOSIP) to gain access to data and ECS services in a transparent manner to the underlying differences between the networks.
			ESN-1340#A	The ESN shall provide support for TCP/IP communications protocols and services to external interfaces as required by the IRDs.
			ESN-1340#B	The ESN shall provide support for TCP/IP communications protocols and services to external interfaces as required by the IRDs.
C-ISS-02010	IR1	The ISS shall provide the capability to filter packets based on the port/socket of the transport layer protocol.	EOSD1990#B	The ECS system and elements shall employ security measures and techniques for all applicable security disciplines which are identified in the preceding documents. These documents shall provide the basis for the ECS security policy.
			ESN-0010#B	ESN shall provide the following standard services: a. Data Transfer and Management Services b. Electronic Messaging Service c. Remote Terminal Service d. Process to Process Communication Service e. Directory and User Access Control Service f. Network Management Service g. Network Security and Access Control Service h. Internetwork Interface Services i. Bulletin Board Service

Internetworking Subsystem L4 to RbR traceability

L4 ID	Rel	L4 Text	RbR ID	RbR Text
			ESN-0007#B	The ESN shall restrict the use of ECS inter-DAAC wide area networks for data transmission between ECS DAACs and other facilities that are directly attached to the ECS external network.
			ESN-1365#B	The ESN shall isolate FOS with secure interfaces.
			ESN-0650#B	The ESN shall perform the following network management functions for each protocol stack implemented in any ECS element, and each communications facility: a. Network Configuration Management b. Network Fault Management c. Network Performance Management d. Network Security Management
			ESN-0650#Ir1	The ESN shall perform the following network management functions for each protocol stack implemented in any ECS element, and each communications facility: a. Network Configuration Management b. Network Fault Management c. Network Performance Management d. Network Security Management
			ESN-0010#Ir1	ESN shall provide the following standard services: a. Data Transfer and Management Services b. Electronic Messaging Service c. Remote Terminal Service d. Process to Process Communication Service e. Directory and User Access Control Service f. Network Management Service g. Network Security and Access Control Service h. Internetwork Interface Services
			ESN-0007#A	The ESN shall restrict the use of ECS inter-DAAC wide area networks for data transmission between ECS DAACs and other facilities that are directly attached to the ECS external network.

Internetworking Subsystem L4 to RbR traceability

L4 ID	Rel	L4 Text	RbR ID	RbR Text
			ESN-0010#A	ESN shall provide the following standard services: a. Data Transfer and Management Services b. Electronic Messaging Service c. Remote Terminal Service d. Process to Process Communication Service e. Directory and User Access Control Service f. Network Management Service g. Network Security and Access Control Service h. Internetwork Interface Services i. Bulletin Board Service
			ESN-0650#A	The ESN shall perform the following network management functions for each protocol stack implemented in any ECS element, and each communications facility: a. Network Configuration Management b. Network Fault Management c. Network Performance Management d. Network Security Management
			ESN-1365#A	The ESN shall isolate FOS with secure interfaces.
			EOSD1990#A	The ECS system and elements shall employ security measures and techniques for all applicable security disciplines which are identified in the preceding documents. These documents shall provide the basis for the ECS security policy.
C-ISS-02020	IR1	The ISS shall provide connectionless transport services as specified by the UDP protocol referenced in RFC 768.	ESN-0003#A	The ESN shall enable researchers on existing networks (TCP/IP and GOSIP) to gain access to data and ECS services in a transparent manner to the underlying differences between the networks.
			ESN-1340#A	The ESN shall provide support for TCP/IP communications protocols and services to external interfaces as required by the IRDs.
			ASTER-1060#A	ECS shall provide support for Transport Control Protocol/Internet Protocol (TCP/IP) communications protocols to the U.S. Gateway for ASTER GDS communications.
			ASTER-1060#B	ECS shall provide support for Transport Control Protocol/Internet Protocol (TCP/IP) communications protocols to the U.S. Gateway for ASTER GDS communications.

Internetworking Subsystem L4 to RbR traceability

L4 ID	Rel	L4 Text	RbR ID	RbR Text
			ESN-0003#Ir1	The ESN shall enable researchers on existing networks (TCP/IP and GOSIP) to gain access to data and ECS services in a transparent manner to the underlying differences between the networks.
			ESN-0003#B	The ESN shall enable researchers on existing networks (TCP/IP and GOSIP) to gain access to data and ECS services in a transparent manner to the underlying differences between the networks.
			ESN-1340#B	The ESN shall provide support for TCP/IP communications protocols and services to external interfaces as required by the IRDs.
			ESN-1340#Ir1	The ESN shall provide support for TCP/IP communications protocols and services to external interfaces as required by the IRDs.
C-ISS-02030	IR1	The ISS shall provide network layer services as specified by the Internet Protocol (IP) suite referenced in RFC 791.	ESN-1340#Ir1	The ESN shall provide support for TCP/IP communications protocols and services to external interfaces as required by the IRDs.
			ESN-0003#B	The ESN shall enable researchers on existing networks (TCP/IP and GOSIP) to gain access to data and ECS services in a transparent manner to the underlying differences between the networks.
			ESN-1340#B	The ESN shall provide support for TCP/IP communications protocols and services to external interfaces as required by the IRDs.
			ESN-0003#Ir1	The ESN shall enable researchers on existing networks (TCP/IP and GOSIP) to gain access to data and ECS services in a transparent manner to the underlying differences between the networks.
			ESN-0003#A	The ESN shall enable researchers on existing networks (TCP/IP and GOSIP) to gain access to data and ECS services in a transparent manner to the underlying differences between the networks.
			ESN-1340#A	The ESN shall provide support for TCP/IP communications protocols and services to external interfaces as required by the IRDs.
C-ISS-02040	A	The ISS shall provide the capability to filter packets based upon network layer source and/or destination addresses.	EOSD1990#B	The ECS system and elements shall employ security measures and techniques for all applicable security disciplines which are identified in the preceding documents. These documents shall provide the basis for the ECS security policy.

Internetworking Subsystem L4 to RbR traceability

L4 ID	Rel	L4 Text	RbR ID	RbR Text
			ESN-1380#B	The ESN shall provide countermeasures for the following security threats related to data communications: a. modification of data (i.e., manipulation) while in transit over the network b. disclosure of authentication information c. degradation in network or processing resource performance through denial of service attack d. Impersonation of authentication credentials or authorization privileges.
			ESN-1365#B	The ESN shall isolate FOS with secure interfaces.
			ESN-0010#B	ESN shall provide the following standard services: a. Data Transfer and Management Services b. Electronic Messaging Service c. Remote Terminal Service d. Process to Process Communication Service e. Directory and User Access Control Service f. Network Management Service g. Network Security and Access Control Service h. Internetwork Interface Services i. Bulletin Board Service
			ESN-0007#B	The ESN shall restrict the use of ECS inter-DAAC wide area networks for data transmission between ECS DAACs and other facilities that are directly attached to the ECS external network.
			EOSD1990#A	The ECS system and elements shall employ security measures and techniques for all applicable security disciplines which are identified in the preceding documents. These documents shall provide the basis for the ECS security policy.
			ESN-0007#A	The ESN shall restrict the use of ECS inter-DAAC wide area networks for data transmission between ECS DAACs and other facilities that are directly attached to the ECS external network.

Internetworking Subsystem L4 to RbR traceability

L4 ID	Rel	L4 Text	RbR ID	RbR Text
			ESN-0010#A	ESN shall provide the following standard services: a. Data Transfer and Management Services b. Electronic Messaging Service c. Remote Terminal Service d. Process to Process Communication Service e. Directory and User Access Control Service f. Network Management Service g. Network Security and Access Control Service h. Internetwork Interface Services i. Bulletin Board Service
			ESN-1380#A	The ESN shall provide countermeasures for the following security threats related to data communications: a. modification of data (i.e., manipulation) while in transit over the network b. disclosure of authentication information c. degradation in network or processing resource performance through denial of service attack d. Impersonation of authentication credentials or authorization privileges.
			ESN-1365#A	The ESN shall isolate FOS with secure interfaces.
C-ISS-02050	IR1	The ISS shall provide ICMP network layer service as specified by RFC 792.	ESN-0003#A	The ESN shall enable researchers on existing networks (TCP/IP and GOSIP) to gain access to data and ECS services in a transparent manner to the underlying differences between the networks.
			ESN-1340#A	The ESN shall provide support for TCP/IP communications protocols and services to external interfaces as required by the IRDs.
			ESN-0780#A	The network elements including the Internet interfaces, shall have the capability to report, periodically and on an interactive basis , network statistics to the ESN network management function, including the following information: a. Network round trip delay b. Network reset and restart indications c. Outages and CRC errors d. Performance statistics
			ESN-0003#B	The ESN shall enable researchers on existing networks (TCP/IP and GOSIP) to gain access to data and ECS services in a transparent manner to the underlying differences between the networks.

Internetworking Subsystem L4 to RbR traceability

L4 ID	Rel	L4 Text	RbR ID	RbR Text
			ESN-0780#B	The network elements including the Internet interfaces, shall have the capability to report, periodically and on an interactive basis , network statistics to the ESN network management function, including the following information: a. Network round trip delay b. Network reset and restart indications c. Outages and CRC errors d. Performance statistics
			ESN-1340#B	The ESN shall provide support for TCP/IP communications protocols and services to external interfaces as required by the IRDs.
			ESN-1340#Ir1	The ESN shall provide support for TCP/IP communications protocols and services to external interfaces as required by the IRDs.
C-ISS-02060	IR1	The ISS shall provide network layer services in compliance with one or more of the following protocols as appropriate to the type of the physical network supported. a. IP over Ethernet as specified in RFCs 894, 895, 826 (ARP), 903 (RARP) b. IP over FDDI as specified in RFC 1188, 1390 (ARP, RARP) c. IP over HiPPI as specified in RFC 1374 (includes ARP, RARP) d. IP over SMDS as specified in RFC 1209 (includes ARP, RARP)	ESN-0003#B	The ESN shall enable researchers on existing networks (TCP/IP and GOSIP) to gain access to data and ECS services in a transparent manner to the underlying differences between the networks.
			ESN-1140#Ir1	The ESN shall provide protocol translation, termination, bridging and routing.
			ESN-1340#Ir1	The ESN shall provide support for TCP/IP communications protocols and services to external interfaces as required by the IRDs.
			ESN-0003#A	The ESN shall enable researchers on existing networks (TCP/IP and GOSIP) to gain access to data and ECS services in a transparent manner to the underlying differences between the networks.

Internetworking Subsystem L4 to RbR traceability

L4 ID	Rel	L4 Text	RbR ID	RbR Text
			ESN-1340#A	The ESN shall provide support for TCP/IP communications protocols and services to external interfaces as required by the IRDs.
			ESN-1140#A	The ESN shall provide protocol translation, termination, bridging and routing.
			ESN-1140#B	The ESN shall provide protocol translation, termination, bridging and routing.
			ESN-1340#B	The ESN shall provide support for TCP/IP communications protocols and services to external interfaces as required by the IRDs.
C-ISS-02100	B	The ISS-INHW CI shall use physical devices and Medium Access Control protocols compatible with the following standards: a. IEEE 802.2 (Logical Link Control) b. IEEE 802.3 (MAC for Ethernet) c. IEEE 802.6 (MAC for SMDS) d. ANSI X3T9.5 (MAC for FDDI).	ESN-1350#B	The ESN LANs shall provide physical devices and the corresponding medium access control (MAC) protocol compatible with ISO and ANSI standards.
C-ISS-02110	B	The ISS-INHW CI physical components, and services shall have the capability to be monitored via SNMP agents.	ESN-0740#B	The ESN network management service shall retrieve performance/fault data about ESN protocol stacks and equipment.
C-ISS-02200	B	The ISS-INHW CI LAN Analysis Equipment shall provide protocol analysis through the transport layer for all ISS LAN protocols and interconnection protocols to MANs/WANs.	ESN-1010#B	The ESN shall provide, for selective use as a debugging aid, the capability to perform packet tracing of its supported protocols.
C-ISS-02210	B	The ISS-INHW CI LAN Analysis Equipment shall include a Communications line monitor.	ESN-1010#B	The ESN shall provide, for selective use as a debugging aid, the capability to perform packet tracing of its supported protocols.
C-ISS-02220	B	The ISS-INHW CI communications line monitor shall store and display up to 10,000 bytes of data sent and received over any of the communications lines at rates of 10Mbits/sec to 100Mbits/sec.	ESN-1010#B	The ESN shall provide, for selective use as a debugging aid, the capability to perform packet tracing of its supported protocols.

Internetworking Subsystem L4 to RbR traceability

L4 ID	Rel	L4 Text	RbR ID	RbR Text
C-ISS-02230	B	The ISS-INHW CI communications line monitor shall support the protocols used within and interconnecting the ECS.	ESN-1010#B	The ESN shall provide, for selective use as a debugging aid, the capability to perform packet tracing of its supported protocols.
C-ISS-02250	B	The ISS-INHW CI LAN Analysis Equipment shall include Local Area Network analyzers.	ESN-1010#B	The ESN shall provide, for selective use as a debugging aid, the capability to perform packet tracing of its supported protocols.
C-ISS-02300	B	The ISS-INHW CI EOC LAN loop delay contribution shall not exceed more than 500 msec (goal 250 msec) seconds of the total ECS delay of 2.5 seconds for emergency real-time commands.	EOSD1000#B	ECS elements shall contribute a loop delay of not greater than 2.5 seconds of the total system delay of five (5) seconds for emergency real-time commands, not including the time needed for command execution. The loop delay is measured from the originator to the spacecraft/instrument and back and only applies when a Tracking and Data Relay Satellite System (TDRSS) link is available for contact to the spacecraft.
			AM1-1150#B	ECS shall contribute a loop delay of not greater than 2.5 seconds of the total system delay of five (5) seconds for emergency real-time commands, not including the time needed for command execution. The loop delay is measured from the originator to the spacecraft/instrument and back and only applies when a Tracking and Data Relay Satellite System (TDRSS) link is available for contact to the spacecraft.
C-ISS-02310	B	The ISS-INHW CI EOC Operational LAN backbone shall be able to support a peak traffic rate of 24 Mbps.	AM1-1050#B	The EOC shall support several uplink rates to the spacecraft, which include at a minimum the following: a. 10 kilobits per second (kbps) (SSA uplink) b. 1 kbps (S-band MA uplink) c. 125 bits per second (bps) (SSA uplink during contingency operations) d. 2 kbps (emergency operations via S-band DSN link)
			AM1-1070#B	The EOC shall provide the capability to receive and process real-time data received as two 16 kbps data streams.
			AM1-0140#B	The SCS shall have the capability to send (in CADU format) and the EOC shall have the capability to receive (in EDUs containing CCSDS telemetry packets) AM-1 spacecraft telemetry data (as defined in AM-1 ICD-106) during spacecraft launch via launch configurations which include EDOS and Ecom.
			AM1-1060#B	The EOC shall be capable of simultaneously receiving all AM-1 telemetry data types.
			EDOS-A.2.1#B	The DIF-EOC interface shall provide the capability to support the transfer of real-time return link EDUs to the EOC at a rate of up to 1.1 Mbps.

Internetworking Subsystem L4 to RbR traceability

L4 ID	Rel	L4 Text	RbR ID	RbR Text
			AM1-1120#B	The EOC shall be capable of receiving a diagnostic telemetry/memory dump packet stream from the SSIM at 16 kbps.
			AM1-1110#B	The EOC shall be capable of receiving a health and safety telemetry packet stream from the SSIM at 1 kbps.
			AM1-1100#B	The EOC shall be capable of receiving two housekeeping telemetry packet streams of 16 kbps from the SSIM.
			AM1-1090#B	The EOC shall be capable of providing CLTUs to the SSIM at the following data rates: a. 125 bps b. 1 kbps c. 2 kbps d. 10 kbps
			AM1-0170#B	The SSIM shall have the capability to send and the EOC shall have the capability to receive simulated recorded AM-1 spacecraft and instrument housekeeping telemetry packets (as defined in AM-1 ICD-106).
			AM1-0200#B	The SSIM shall have the capability to send and the EOC shall have the capability to receive simulated AM-1 SCC, CTIU, and instrument microprocessor memory dump telemetry (as defined in AM-1 ICD-106).
			AM1-1080-#B	The EOC shall provide the capability to receive and record spacecraft recorder data at rates up to 1.544 Mbps.
C-ISS-02320	B	The ISS-INHW CI shall provide wide area bandwidth necessary to support data transfer in accordance with requirements specified in "Communications Requirements for the ECS Project", 194-220-SE3-001.	ESN-0005#B	The ESN internal networks shall be dedicated networks linking ECS facilities for internal ECS operations (e.g., scheduling, product generation, QA validation).

Internetworking Subsystem L4 to RbR traceability

L4 ID	Rel	L4 Text	RbR ID	RbR Text
C-ISS-02330	B	The ISS-INHW CI shall provide sufficient local area network bandwidth at the LaRC DAAC to support data transfer between and among physical nodes provided by SDPS, MSS and CSS in accordance with the Release B network I/O sizing listed in Appendix A of the current version of 304-CD-005.	EOSD1010#B	ECS shall support daily data volume, processing load, storage volume, instrument support, and data traffic as derivable from and specified in Appendix C and D.
			EDOS-B.2.1#B	The DIF-LaRC DAAC interface shall provide the capability to support the transfer of Operations Management data to the LaRC DAAC at a rate of up to 50 Kbps.
C-ISS-02340	B	The ISS-INHW CI shall provide sufficient local area network bandwidth at the MSFC DAAC to support data transfer between and among physical nodes provided by SDPS, MSS and CSS in accordance with the Release B network I/O sizing listed in Appendix A of the current version of 304-CD-005.	ESN-0070#B	The ESN shall support the elements data flow requirements identified in this specification.
C-ISS-02350	B	The ISS-INHW CI shall provide sufficient local area network bandwidth at the GSFC DAAC to support data transfer between and among physical nodes provided by SDPS, MSS and CSS in accordance with the Release B network I/O sizing listed in Appendix A of the current version of 304-CD-005.	EOSD1010#B	ECS shall support daily data volume, processing load, storage volume, instrument support, and data traffic as derivable from and specified in Appendix C and D.
			EDOS-C.2.1#B	The DIF-GSFC DAAC interface shall provide the capability to support the transfer of Operations Management data to the GSFC DAAC at a rate of up to 50 Kbps.
			EDOS-H.2.1#B	The DIF-SMC interface shall provide the capability to support the transfer of Operations Management data to the SMC at a rate of up to 50 kbps.

Internetworking Subsystem L4 to RbR traceability

L4 ID	Rel	L4 Text	RbR ID	RbR Text
C-ISS-02360	B	The ISS-INHW CI shall provide sufficient local area network bandwidth at the EDC DAAC to support data transfer between and among physical nodes provided by SDPS, MSS and CSS in accordance with the Release B network sizing listed in Appendix A of the current version of 304-CD-005.	EOSD1010#B	ECS shall support daily data volume, processing load, storage volume, instrument support, and data traffic as derivable from and specified in Appendix C and D.
C-ISS-02370	B	The ISS-INHW CI shall reuse the existing V0 DAAC LAN at EDC for Release A.	ESN-0070#B	The ESN shall support the elements data flow requirements identified in this specification.
C-ISS-02380	B	The ISS-INHW CI LANs at the GSFC, MSFC and LaRC DAAC sites shall be capable of supporting twice the R-A network traffic load estimates without redesign.	ESN-0240#B	The ESN shall be extensible in its design to provide capability for growth and enhancement.
C-ISS-02390	B	The ISS-INHW CI LANs at the DAAC sites shall be designed in a manner that allows a. Nodes to be added to any given LAN segment. b. Additional LAN segments to be added to the LAN.	ESN-1206#B	The ESN capacity and performance shall be consistent with the specified capacity and performance requirements of the ECS functions.
C-ISS-02400	B	The ISS-INHW CI EOC Operational LAN shall be able to support 230 network devices without redesign.	ESN-1207#B	The ESN capacity and performance shall be capable of expansion to be consistent with the specified capacity and performance growth requirements of the ECS elements and functions.
C-ISS-02410	B	The ISS-INHW CI EOC Operational LAN shall be able to support peak data rates of up to 48 Mbps without redesign.	EOSD1040#B	ECS shall provide sufficient capacity to permit the reprocessing of all EOS science data at twice the incoming data rate at a minimum, concurrently with processing of new data.

Internetworking Subsystem L4 to RbR traceability

L4 ID	Rel	L4 Text	RbR ID	RbR Text
C-ISS-02500	B	The ISS-INHW CI networks shall support the use of network and transport layer filtering to control access from internal and external interfaces.	EOSD2100#B	The ECS technical security policy planning shall be comprehensive and shall cover at least the following areas: a. Applicability of the C2 Level of Trustedness as defined by the NSA b. Applicability of the C2 Object Reuse capability c. Discretionary control and monitoring of user access d. ECS communications, network access, control, and monitoring e. Computer system "virus" monitoring, detection, and remedy f. Data protection controls g. Account/privilege management and user session tailoring h. Restart/recovery i. Security audit trail generation j. Security analysis and reporting k. Risk analysis
C-ISS-02510	A	The EOC LANs shall be capable of supporting multicasting.	ESN-0070#A	The ESN shall support the elements data flow requirements identified in this specification.
			ESN-0070#B	The ESN shall support the elements data flow requirements identified in this specification.
C-ISS-02520	IR1	The ISS shall provide services based on the Open Shortest Path First (OSPF) protocol referenced in RFC 1583 to route traffic between the source and destination nodes, maintain route databases, and exchange routing information between networks.	ESN-1340#Ir1	The ESN shall provide support for TCP/IP communications protocols and services to external interfaces as required by the IRDs.
			ESN-0003#B	The ESN shall enable researchers on existing networks (TCP/IP and GOSIP) to gain access to data and ECS services in a transparent manner to the underlying differences between the networks.
			ESN-1340#B	The ESN shall provide support for TCP/IP communications protocols and services to external interfaces as required by the IRDs.
			ESN-0003#A	The ESN shall enable researchers on existing networks (TCP/IP and GOSIP) to gain access to data and ECS services in a transparent manner to the underlying differences between the networks.

Internetworking Subsystem L4 to RbR traceability

L4 ID	Rel	L4 Text	RbR ID	RbR Text
			ESN-1340#A	The ESN shall provide support for TCP/IP communications protocols and services to external interfaces as required by the IRDs.
C-ISS-02530	IR1	The ISS shall provide services based on the Routing Information Protocol (RIP) referenced in RFC 1058 to route network traffic between the source and destination nodes.	ESN-0003#A	The ESN shall enable researchers on existing networks (TCP/IP and GOSIP) to gain access to data and ECS services in a transparent manner to the underlying differences between the networks.
			ESN-1340#A	The ESN shall provide support for TCP/IP communications protocols and services to external interfaces as required by the IRDs.
			ESN-0003#B	The ESN shall enable researchers on existing networks (TCP/IP and GOSIP) to gain access to data and ECS services in a transparent manner to the underlying differences between the networks.
			ESN-1340#B	The ESN shall provide support for TCP/IP communications protocols and services to external interfaces as required by the IRDs.
			ESN-1340#Ir1	The ESN shall provide support for TCP/IP communications protocols and services to external interfaces as required by the IRDs.
C-ISS-02600	B	The ISS-INHW CI DAAC LANs shall provide transparent portability across heterogeneous site LAN architectures.	EOSD5100#B	ECS shall enable evolution of ECS to be a federated unit within GCDIS, e.g. GCDIS data centers should not have to negotiate different interfaces with each DAAC.
C-ISS-02610	B	The ISS-INHW CI DAAC LANs shall enable expansion to GByte networks including the ability to provide increased volume of data distribution and access.	EOSD5070#B	ECS shall enable expansion to GByte networks including the ability to provide increased volume of data distribution/access..
C-ISS-04020	A	Backups of all router configuration files shall be maintained at the local DAAC and the Network Management Facility (NMF).	EOSD4035#A	The ESN shall have no single point of failure for functions associated with network databases and configuration data.
			EOSD4035#B	The ESN shall have no single point of failure for functions associated with network databases and configuration data.

Internetworking Subsystem L4 to RbR traceability

L4 ID	Rel	L4 Text	RbR ID	RbR Text
C-ISS-04040	A	The EOC Operational LAN shall have no single point of failure for critical real-time functions.	EOSD3710#B	The ECS shall have no single point of failure for functions associated with real-time operations of the spacecraft and instruments.
			EOSD3710#A	The ECS shall have no single point of failure for functions associated with real-time operations of the spacecraft and instruments.
C-ISS-04050	A	The EOC Operational LAN shall be configured to support the FOS availability of .9998 and a mean down time of < 1 minute for critical real-time data during times of staffed operation.	EOSD3800#B	The FOS shall have an operational availability of 0.9998 at a minimum (.99997 design goal) and an MDT of one (1) minute or less (0.5 minute design goal) for critical real∞ time functions that support: a. Launch b. Early orbit checkout c. Disposal d. Orbit adjustment e. Anomaly investigation f. Recovery from safe mode g. Routine real-time commanding and associated monitoring for spacecraft and instrument health and safety
			EOSD3800#A	The FOS shall have an operational availability of 0.9998 at a minimum (.99997 design goal) and an MDT of one (1) minute or less (0.5 minute design goal) for critical real∞ time functions that support: a. Launch b. Early orbit checkout c. Disposal d. Orbit adjustment e. Anomaly investigation f. Recovery from safe mode g. Routine real-time commanding and associated monitoring for spacecraft and instrument health and safety
C-ISS-04055	A	The EOC Support LAN shall have an operational availability of at least 0.96 and shall have a mean down time of no greater than 4 hours during times of staffed operation, unless otherwise specified.	EOSD3700#A	ECS functions shall have an operational availability of 0.96 at a minimum (.998 design goal) and an MDT of four (4) hours or less (1.5 hour design goal), unless otherwise specified. The above requirement covers equipment including: a. "Non-critical" equipment configured with the critical equipment supporting the functional capabilities in the requirements. b. Equipment providing other functionality not explicitly stated in the RMA requirements that follow.

Internetworking Subsystem L4 to RbR traceability

L4 ID	Rel	L4 Text	RbR ID	RbR Text
			EOSD3700#B	ECS functions shall have an operational availability of 0.96 at a minimum (.998 design goal) and an MDT of four (4) hours or less (1.5 hour design goal), unless otherwise specified. The above requirement covers equipment including: a. "Non-critical" equipment configured with the critical equipment supporting the functional capabilities in the requirements. b. Equipment providing other functionality not explicitly stated in the RMA requirements that follow.
C-ISS-04060	A	The portion of the DAAC LAN supporting the SDPS function of receiving science data shall contribute to the function's operational availability of 0.999 at a minimum and a mean down time of two (2) hours or less during times of staffed operation.	EOSD3900#B	The SDPS function of receiving science data shall have an operational availability of 0.999 at a minimum (.99995 design goal) and an MDT of two (2) hours or less (8 minutes design goal).
			EOSD3900#A	The SDPS function of receiving science data shall have an operational availability of 0.999 at a minimum (.99995 design goal) and an MDT of two (2) hours or less (8 minutes design goal).
			ASTER-2060#B	The ECS SDPS function of receiving science data shall have an operational availability of 0.999 at a minimum and an MDT of two (2) hours or less.
C-ISS-04070	A	The portion of the DAAC LAN supporting the SDPS function of archiving and distributing data shall contribute to the function's operational availability of 0.98 at a minimum and a mean down time of two (2) hours or less during times of staffed operation.	EOSD4036#A	The operational availability of individual ESN segments shall be consistent with the specified operational availability of the supported ECS functions.
			EOSD4036#B	The operational availability of individual ESN segments shall be consistent with the specified operational availability of the supported ECS functions.

Internetworking Subsystem L4 to RbR traceability

L4 ID	Rel	L4 Text	RbR ID	RbR Text
C-ISS-04080	A	The portion of the DAAC LAN supporting the SDPS function of User Interfaces to Client, Interoperability, Data Server, and Data Management (IMS) services at Individual DAAC Sites shall contribute to the function's operational availability of 0.993 at a minimum and a mean down time requirement of two (2) hours or less during times of staffed operations.	EOSD4036#B	The operational availability of individual ESN segments shall be consistent with the specified operational availability of the supported ECS functions.
			EOSD4036#A	The operational availability of individual ESN segments shall be consistent with the specified operational availability of the supported ECS functions.
C-ISS-04090	A	The portion of the DAAC LAN supporting the SDPS function of information searches on the ECS Directory shall contribute to the function's operational availability of 0.993 at a minimum and a mean down time of two (2) hours or less during times of staffed operation.	EOSD4036#A	The operational availability of individual ESN segments shall be consistent with the specified operational availability of the supported ECS functions.
			EOSD4036#B	The operational availability of individual ESN segments shall be consistent with the specified operational availability of the supported ECS functions.
C-ISS-04102	B	The portion of the EDC DAAC LAN supporting the SDPS function of Data Acquisition Request (DAR) Submittal including TOOs shall contribute to the function's operational availability of 0.993 at a minimum and mean down time of two (2) hours or less during times of staffed operation.	EOSD4036#B	The operational availability of individual ESN segments shall be consistent with the specified operational availability of the supported ECS functions.

Internetworking Subsystem L4 to RbR traceability

L4 ID	Rel	L4 Text	RbR ID	RbR Text
C-ISS-04110	A	The portion of the DAAC LAN supporting the SDPS function of metadata ingest and update shall contribute to the function's operational availability of 0.96 at a minimum and a mean down time of four (4) hours or less during times of staffed operation.	EOSD4036#B	The operational availability of individual ESN segments shall be consistent with the specified operational availability of the supported ECS functions.
			EOSD4036#A	The operational availability of individual ESN segments shall be consistent with the specified operational availability of the supported ECS functions.
C-ISS-04120	A	The portion of the DAAC LAN supporting the SDPS function of information searches on local holdings shall contribute to the function's operational availability of 0.96 at a minimum and a mean down time of four (4) hours or less during times of staffed operation.	EOSD4036#A	The operational availability of individual ESN segments shall be consistent with the specified operational availability of the supported ECS functions.
			EOSD4036#B	The operational availability of individual ESN segments shall be consistent with the specified operational availability of the supported ECS functions.
C-ISS-04130	A	The portion of the DAAC LAN supporting the SDPS function of local data order submission shall contribute to the function's operational availability of 0.96 at a minimum and a mean down time of four (4) hours or less during times of staffed operations.	EOSD4036#B	The operational availability of individual ESN segments shall be consistent with the specified operational availability of the supported ECS functions.
			EOSD4036#A	The operational availability of individual ESN segments shall be consistent with the specified operational availability of the supported ECS functions.

Internetworking Subsystem L4 to RbR traceability

L4 ID	Rel	L4 Text	RbR ID	RbR Text
C-ISS-04140	A	The portion of the DAAC LAN supporting the SDPS function of local data order submission across DAACs shall contribute to the function's operational availability of 0.96 at a minimum and a mean down time of four (4) hours or less during times of staffed operation.	EOSD4036#A	The operational availability of individual ESN segments shall be consistent with the specified operational availability of the supported ECS functions.
			EOSD4036#B	The operational availability of individual ESN segments shall be consistent with the specified operational availability of the supported ECS functions.
C-ISS-04150	A	The portion of the DAAC LAN supporting the SDPS function of Client, Interoperability, Data Management and Data Server (IMS) Data Base Management and Maintenance Interface shall contribute to the function's operational availability of 0.96 at a minimum and a mean down time of four (4) hours or less during times of staffed operation.	EOSD4036#B	The operational availability of individual ESN segments shall be consistent with the specified operational availability of the supported ECS functions.
			EOSD4036#A	The operational availability of individual ESN segments shall be consistent with the specified operational availability of the supported ECS functions.
C-ISS-04155	A	The ISS services at the SMC shall be configured to support the SMC function of Gathering and Disseminating System Management Information's Availability requirement of .998 and a Mean Down Time of < 20 minutes during times of staffed operation.	EOSD4030#B	The SMC function of gathering and disseminating system management information shall have an operational availability of .998 at a minimum (.999998 design goal) and an MDT of 20 minutes or less (5 minutes design goal), for critical services.
			EOSD4030#A	The SMC function of gathering and disseminating system management information shall have an operational availability of .998 at a minimum (.999998 design goal) and an MDT of 20 minutes or less (5 minutes design goal), for critical services.

Internetworking Subsystem L4 to RbR traceability

L4 ID	Rel	L4 Text	RbR ID	RbR Text
C-ISS-04160	A	The ISS elements and components shall include the on-line (operational mode) and off-line (test mode) fault detection and isolation capabilities required to achieve the specified operational availability requirements.	EOSD4100#A	The ECS segments, elements, and components shall include the on-line (operational mode) and off-line (test mode) fault detection and isolation capabilities required to achieve the specified operational availability requirements.
			EOSD4100#B	The ECS segments, elements, and components shall include the on-line (operational mode) and off-line (test mode) fault detection and isolation capabilities required to achieve the specified operational availability requirements.
C-ISS-04165	A	The maximum down time of the ISS-INHCI shall not exceed twice the required MDT in 99 percent of failure occurrences.	EOSD3630#A	The maximum down time shall not exceed twice the required MDT in 99 percent of failure occurrences.
			EOSD3630#B	The maximum down time shall not exceed twice the required MDT in 99 percent of failure occurrences.
C-ISS-04170	A	The EOC Operational LAN shall be configured to support the FOS availability of .99925 and a mean down time of < 5 minutes for non-critical real-time data during times of staffed operation.	EOSD3810#B	The FOS shall have an operational availability of 0.99925 at a minimum (.99997 design goal) and an MDT of five (5) minutes or less (0.5 minute design goal) for non∞ critical real-time functions.
			EOSD3810#A	The FOS shall have an operational availability of 0.99925 at a minimum (.99997 design goal) and an MDT of five (5) minutes or less (0.5 minute design goal) for non∞ critical real-time functions.
C-ISS-06000	A	The ISS network architecture shall enable expansion to GByte networks including the ability to provide increased volume of data distribution/access.	EOSD0545#B	ECS shall be able to accommodate growth (e.g., capacity) in all of its functions as well as the addition of new functions.
			EOSD5070#A	ECS shall enable expansion to GByte networks including the ability to provide increased volume of data distribution/access..

Internetworking Subsystem L4 to RbR traceability

L4 ID	Rel	L4 Text	RbR ID	RbR Text
			EOSD5070#B	ECS shall enable expansion to GByte networks including the ability to provide increased volume of data distribution/access..
C-ISS-11020	B	The ISS shall interface with NSI at GSFC, MSFC, LaRC, EDC, JPL, NSIDC, ORNL, and ASF to provide DAAC access to science users in accordance with the following documents: a. DID 220, "Communications Requirements for the ECS Project" 194-220-SE3-001 b. Interface Requirements Document between EOSDIS Core System (ECS) and the NASA Science Internet (NSI), 194-219-SE1-001	ESN-0006#B	ESN shall interface with NSI to reach all external non-ECS network-attached facilities and science users.
C-ISS-11090	B	The ISS shall provide for local or metro area connectivity to V0 network nodes at the GSFC, LaRC, MSFC, JPL, ASF, and NSIDC DAAC sites in order to provide interoperability between ECS and V0.	EOSD1695#B	The ECS shall provide 2-way interoperability with the V0 system.
			ESN-0010#B	ESN shall provide the following standard services: a. Data Transfer and Management Services b. Electronic Messaging Service c. Remote Terminal Service d. Process to Process Communication Service e. Directory and User Access Control Service f. Network Management Service g. Network Security and Access Control Service h. Internetwork Interface Services i. Bulletin Board Service
			V0-0055#B	Version 0 shall permit ECS to use agreed upon Version 0 network components and services.
C-ISS-11170	B	The ISS shall provide for connectivity between the EOC and EBnet.	NI-0110#B	ECS shall have the capability to communicate with the NCC via the Ecom interface.

Internetworking Subsystem L4 to RbR traceability

L4 ID	Rel	L4 Text	RbR ID	RbR Text
			NI-0310-a#B	ECS shall have the capability to communicate with the FDF via the Ecom interface (FOS and CSMS only).
			NI-0210#B	ECS shall have the capability to communicate with the GN, DSN, and WOTS via the EDOS/Ecom interface.
			AM1-1060#B	The EOC shall be capable of simultaneously receiving all AM-1 telemetry data types.
			ESN-0010#B	ESN shall provide the following standard services: a. Data Transfer and Management Services b. Electronic Messaging Service c. Remote Terminal Service d. Process to Process Communication Service e. Directory and User Access Control Service f. Network Management Service g. Network Security and Access Control Service h. Internetwork Interface Services i. Bulletin Board Service
			ESN-0070#B	The ESN shall support the elements data flow requirements identified in this specification.
C-ISS-11180	B	The ISS shall provide for connectivity between the EOC and NSI for EOC/IST communications.	ESN-0010#B	ESN shall provide the following standard services: a. Data Transfer and Management Services b. Electronic Messaging Service c. Remote Terminal Service d. Process to Process Communication Service e. Directory and User Access Control Service f. Network Management Service g. Network Security and Access Control Service h. Internetwork Interface Services i. Bulletin Board Service
			ESN-0070#B	The ESN shall support the elements data flow requirements identified in this specification.
			ESN-1367#B	IST users not within FOS facilities shall communicate with secure interfaces only with the use of a data integrity service.

Internetworking Subsystem L4 to RbR traceability

L4 ID	Rel	L4 Text	RbR ID	RbR Text
C-ISS-11195	B	The ISS shall provide for connectivity with EBnet at the following ECS sites: a. GSFC DAAC b. GSFC EOC c. GSFC SMC d. LaRC DAAC e. MSF DAAC f. JPL DAAC g.ASF DAAC h. NSIDC DAAC i. EDC DAAC	EOSD0010#B	ECS shall use and support the Space Network (SN), via the EDOS/Ecom interface, to obtain the forward and return link data communications needed to achieve full end-to-end ECS functionality.
			EOSD0015#B	ECS shall use and support the Deep Space Network (DSN), the Ground Network (GN), and the Wallops Orbital Tracking Station (WOTS), via the EDOS/Ecom/Nascom interface, as backup of the SN, to obtain forward and return link data communications.
			EOSD0020#B	ECS shall use and support the EDOS/Ecom interface to obtain the data capture, data archival, and data distribution services needed to achieve full end-to-end ECS functionality.
			NI-0010#B	ECS shall have the capability to communicate with the TDRSS via the EDOS/Ecom interface.
			NI-0310-b#B	ECS shall have the capability to communicate with the FDF via the Ecom interface (FOS, SDPS, CSMS)
			NI-0230#B	ECS shall have the capability to interface with the GN, DSN, and WOTS for obtaining return link (telemetry) data from EOS spacecraft (via the EDOS/Ecom interface). Mission-specific requirements for supporting EOS spacecraft telemetry operations will be documented in the EOS mission-level Detailed Mission Requirements documents.
			NI-0020#B	ECS shall have the capability to communicate with the TDRSS for transmitting commands to EOS spacecraft (via the EDOS/Ecom interface). Mission-specific requirements for supporting EOS spacecraft command operations will be documented in the EOS mission-level Detailed Mission Requirements documents.

Internetworking Subsystem L4 to RbR traceability

L4 ID	Rel	L4 Text	RbR ID	RbR Text
			NI-0220#B	ECS shall have the capability to communicate with the GN, DSN, and WOTS for transmitting commands to EOS spacecraft (via the EDOS/Ecom interface). Mission-specific requirements for supporting EOS spacecraft command operations will be documented in the EOS mission-level Detailed Mission Requirements documents.
			NI-0030#B	ECS shall have the capability to interface with the TDRSS for obtaining return link (telemetry) data from EOS spacecraft (via the EDOS/Ecom interface). Mission-specific requirements for supporting EOS spacecraft telemetry operations will be documented in the EOS mission Detailed Mission Requirements documents.
C-ISS-11220	B	The ISS shall provide LAN connectivity and OSI Layer 1 through 4 (i.e., from the physical to the transport layer) services at the GSFC DAAC.	ESN-0010#B	ESN shall provide the following standard services: a. Data Transfer and Management Services b. Electronic Messaging Service c. Remote Terminal Service d. Process to Process Communication Service e. Directory and User Access Control Service f. Network Management Service g. Network Security and Access Control Service h. Internetwork Interface Services i. Bulletin Board Service
			ESN-0070#B	The ESN shall support the elements data flow requirements identified in this specification.
C-ISS-11230	B	The ISS shall provide LAN connectivity and OSI Layer 1 through 4 (i.e., from the physical to the transport layer) services at the LaRC DAAC.	ESN-0010#B	ESN shall provide the following standard services: a. Data Transfer and Management Services b. Electronic Messaging Service c. Remote Terminal Service d. Process to Process Communication Service e. Directory and User Access Control Service f. Network Management Service g. Network Security and Access Control Service h. Internetwork Interface Services i. Bulletin Board Service
			ESN-0070#B	The ESN shall support the elements data flow requirements identified in this specification.

Internetworking Subsystem L4 to RbR traceability

L4 ID	Rel	L4 Text	RbR ID	RbR Text
C-ISS-11240	B	The ISS shall provide LAN connectivity and OSI Layer 1 through 4 (i.e., from the physical to the transport layer) services at the EDC DAAC.	ESN-0010#B	ESN shall provide the following standard services: a. Data Transfer and Management Services b. Electronic Messaging Service c. Remote Terminal Service d. Process to Process Communication Service e. Directory and User Access Control Service f. Network Management Service g. Network Security and Access Control Service h. Internetwork Interface Services i. Bulletin Board Service
			ESN-0070#B	The ESN shall support the elements data flow requirements identified in this specification.
C-ISS-11250	B	The ISS shall provide LAN connectivity and OSI Layer 1 through 4 (i.e., from the physical to the transport layer) services at the MSFC DAAC.	ESN-0010#B	ESN shall provide the following standard services: a. Data Transfer and Management Services b. Electronic Messaging Service c. Remote Terminal Service d. Process to Process Communication Service e. Directory and User Access Control Service f. Network Management Service g. Network Security and Access Control Service h. Internetwork Interface Services i. Bulletin Board Service
			ESN-0070#B	The ESN shall support the elements data flow requirements identified in this specification.
C-ISS-11260	B	The ISS shall provide LAN connectivity and OSI Layer 1 through 4 (i.e., from the physical to the transport layer) services between components at the SMC.	ESN-0070#B	The ESN shall support the elements data flow requirements identified in this specification.

Internetworking Subsystem L4 to RbR traceability

L4 ID	Rel	L4 Text	RbR ID	RbR Text
C-ISS-20000	B	The ISS shall provide LANs at the following Release B sites: a. GSFC DAAC; b. GSFC EOC; c. EDC DAAC; d. LaRC DAAC; e. MSFC DAAC; f. GSFC SMC; g. JPL DAAC; h. ASF DAAC; i. ORNL DAAC; j. NSIDC DAAC	ESN-0010#B	ESN shall provide the following standard services: a. Data Transfer and Management Services b. Electronic Messaging Service c. Remote Terminal Service d. Process to Process Communication Service e. Directory and User Access Control Service f. Network Management Service g. Network Security and Access Control Service h. Internetwork Interface Services i. Bulletin Board Service
			ESN-0070#B	The ESN shall support the elements data flow requirements identified in this specification.
C-ISS-20050	B	The ISS shall provide sufficient local area network bandwidth at the JPL DAAC to support data transfer between and among physical nodes provided in accordance with the Release B network I/O sizing listed in Appendix A of the current version of 304-CD-005.	ESN-0010#B	ESN shall provide the following standard services: a. Data Transfer and Management Services b. Electronic Messaging Service c. Remote Terminal Service d. Process to Process Communication Service e. Directory and User Access Control Service f. Network Management Service g. Network Security and Access Control Service h. Internetwork Interface Services i. Bulletin Board Service
			ESN-0070#B	The ESN shall support the elements data flow requirements identified in this specification.
C-ISS-20060	B	The ISS shall provide sufficient local area network bandwidth at the ASF DAAC to support data transfer between and among physical nodes in accordance with the Release B network I/O sizing listed in Appendix A of the current version of 304-CD-005.	ESN-0010#B	ESN shall provide the following standard services: a. Data Transfer and Management Services b. Electronic Messaging Service c. Remote Terminal Service d. Process to Process Communication Service e. Directory and User Access Control Service f. Network Management Service g. Network Security and Access Control Service h. Internetwork Interface Services i. Bulletin Board Service
			ESN-0070#B	The ESN shall support the elements data flow requirements identified in this specification.

Internetworking Subsystem L4 to RbR traceability

L4 ID	Rel	L4 Text	RbR ID	RbR Text
C-ISS-20070	B	The ISS shall provide sufficient local area network bandwidth at the ORNL DAAC to support data transfer between and among physical nodes in accordance with the Release B network I/O sizing listed in Appendix A of the current version of 304-CD-005.	ESN-0010#B	ESN shall provide the following standard services: a. Data Transfer and Management Services b. Electronic Messaging Service c. Remote Terminal Service d. Process to Process Communication Service e. Directory and User Access Control Service f. Network Management Service g. Network Security and Access Control Service h. Internetwork Interface Services i. Bulletin Board Service
			ESN-0070#B	The ESN shall support the elements data flow requirements identified in this specification.
C-ISS-20080	B	The ISS shall provide sufficient local area network bandwidth at the NSIDC DAAC to support data transfer between and among physical nodes in accordance with the Release B network sizing listed in Appendix A of the current version of 304-CD-005.	ESN-0010#B	ESN shall provide the following standard services: a. Data Transfer and Management Services b. Electronic Messaging Service c. Remote Terminal Service d. Process to Process Communication Service e. Directory and User Access Control Service f. Network Management Service g. Network Security and Access Control Service h. Internetwork Interface Services i. Bulletin Board Service
			ESN-0070#B	The ESN shall support the elements data flow requirements identified in this specification.
C-ISS-20090	B	The ISS LANs at the Release B sites shall be capable of supporting twice the R-B network traffic load estimates without redesign.	ESN-1207#B	The ESN capacity and performance shall be capable of expansion to be consistent with the specified capacity and performance growth requirements of the ECS elements and functions.
C-ISS-20100	B	The ISS LANs shall be designed in a manner that allows a. Nodes to be added to any given LAN segment.; b. Additional LAN segments to be added to the LAN.	ESN-0240#B	The ESN shall be extensible in its design to provide capability for growth and enhancement.

Internetworking Subsystem L4 to RbR traceability

L4 ID	Rel	L4 Text	RbR ID	RbR Text
			ESN-1207#B	The ESN capacity and performance shall be capable of expansion to be consistent with the specified capacity and performance growth requirements of the ECS elements and functions.
C-ISS-20110	B	The ISS shall provide for connectivity to the ASF campus network to enable transfer of data between the ASF DAAC and the ASF production systems associated with ERS-1/2, JERS∞ 1, and RADARSAT.	ESN-0010#B	ESN shall provide the following standard services: a. Data Transfer and Management Services b. Electronic Messaging Service c. Remote Terminal Service d. Process to Process Communication Service e. Directory and User Access Control Service f. Network Management Service g. Network Security and Access Control Service h. Internetwork Interface Services i. Bulletin Board Service
			ESN-0070#B	The ESN shall support the elements data flow requirements identified in this specification.
C-ISS-20120	B	The ISS shall provide for connectivity between the EOC and EBnet for AM-1 instrument flight operations.	ESN-0010#B	ESN shall provide the following standard services: a. Data Transfer and Management Services b. Electronic Messaging Service c. Remote Terminal Service d. Process to Process Communication Service e. Directory and User Access Control Service f. Network Management Service g. Network Security and Access Control Service h. Internetwork Interface Services i. Bulletin Board Service
			NI-0110#B	ECS shall have the capability to communicate with the NCC via the Ecom interface.
			NI-0210#B	ECS shall have the capability to communicate with the GN, DSN, and WOTS via the EDOS/Ecom interface.
			NI-0310-a#B	ECS shall have the capability to communicate with the FDF via the Ecom interface (FOS and CSMS only).

Internetworking Subsystem L4 to RbR traceability

L4 ID	Rel	L4 Text	RbR ID	RbR Text
C-ISS-20130	B	The ISS shall provide LAN connectivity and OSI Layer 1 through 4 (i.e., from the physical to the transport layer) services at the JPL DAAC.	ESN-0010#B	ESN shall provide the following standard services: a. Data Transfer and Management Services b. Electronic Messaging Service c. Remote Terminal Service d. Process to Process Communication Service e. Directory and User Access Control Service f. Network Management Service g. Network Security and Access Control Service h. Internetwork Interface Services i. Bulletin Board Service
			ESN-0070#B	The ESN shall support the elements data flow requirements identified in this specification.
C-ISS-20140	B	The ISS shall provide LAN connectivity and OSI Layer 1 through 4 (i.e., from the physical to the transport layer) services at the ASF DAAC.	ESN-0010#B	ESN shall provide the following standard services: a. Data Transfer and Management Services b. Electronic Messaging Service c. Remote Terminal Service d. Process to Process Communication Service e. Directory and User Access Control Service f. Network Management Service g. Network Security and Access Control Service h. Internetwork Interface Services i. Bulletin Board Service
			ESN-0070#B	The ESN shall support the elements data flow requirements identified in this specification.
C-ISS-20150	B	The ISS shall provide LAN connectivity and OSI Layer 1 through 4 (i.e., from the physical to the transport layer) services at the ORNL DAAC.	ESN-0010#B	ESN shall provide the following standard services: a. Data Transfer and Management Services b. Electronic Messaging Service c. Remote Terminal Service d. Process to Process Communication Service e. Directory and User Access Control Service f. Network Management Service g. Network Security and Access Control Service h. Internetwork Interface Services i. Bulletin Board Service
			ESN-0070#B	The ESN shall support the elements data flow requirements identified in this specification.

Internetworking Subsystem L4 to RbR traceability

L4 ID	Rel	L4 Text	RbR ID	RbR Text
C-ISS-20160	B	The ISS shall provide LAN connectivity and OSI Layer 1 through 4 (i.e., from the physical to the transport layer) services at the NSIDC DAAC.	ESN-0010#B	ESN shall provide the following standard services: a. Data Transfer and Management Services b. Electronic Messaging Service c. Remote Terminal Service d. Process to Process Communication Service e. Directory and User Access Control Service f. Network Management Service g. Network Security and Access Control Service h. Internetwork Interface Services i. Bulletin Board Service
			ESN-0070#B	The ESN shall support the elements data flow requirements identified in this specification.
C-ISS-20170	B	The ISS shall provide LAN connectivity and OSI Layer 1 through 4 (i.e., from the physical to the transport layer) services at the GSFC EOC.	ESN-0010#B	ESN shall provide the following standard services: a. Data Transfer and Management Services b. Electronic Messaging Service c. Remote Terminal Service d. Process to Process Communication Service e. Directory and User Access Control Service f. Network Management Service g. Network Security and Access Control Service h. Internetwork Interface Services i. Bulletin Board Service
			ESN-0070#B	The ESN shall support the elements data flow requirements identified in this specification.
C-ISS-20180	B	The ISS shall receive diagnostic test requests from the MSS.	ESN-0620#B	The ESN shall include a network management function to monitor and control the ESN.
			ESN-0640#B	The ESN shall include management functions at each ECS element, equipment or gateway within the ESN.
C-ISS-20190	B	The ISS-INHW CI shall contribute to the response time and performance requirements specified in Appendix E (Section E.7 Table E-8) of the current version of 304-CD-005.	ESN-1206#B	The ESN capacity and performance shall be consistent with the specified capacity and performance requirements of the ECS functions.

Internetworking Subsystem L4 to RbR traceability

L4 ID	Rel	L4 Text	RbR ID	RbR Text
			ESN-1207#B	The ESN capacity and performance shall be capable of expansion to be consistent with the specified capacity and performance growth requirements of the ECS elements and functions.
C-ISS-20200	B	The ISS shall send diagnostic test requests to the MSS.	ESN-0620#B	The ESN shall include a network management function to monitor and control the ESN.
			ESN-0640#B	The ESN shall include management functions at each ECS element, equipment or gateway within the ESN.
C-ISS-21010	B	The ISS-INHW CI shall provide LANs at the following sites: a. GSFC DAAC LAN b. GSFC EOC LAN c. EDC DAAC LAN d. LaRC DAAC LAN e. MSFC DAAC LAN f. GSFC SMC LAN	ESN-0003#B	The ESN shall enable researchers on existing networks (TCP/IP and GOSIP) to gain access to data and ECS services in a transparent manner to the underlying differences between the networks.
			ESN-0010#B	ESN shall provide the following standard services: a. Data Transfer and Management Services b. Electronic Messaging Service c. Remote Terminal Service d. Process to Process Communication Service e. Directory and User Access Control Service f. Network Management Service g. Network Security and Access Control Service h. Internetwork Interface Services i. Bulletin Board Service
			ESN-0650#B	The ESN shall perform the following network management functions for each protocol stack implemented in any ECS element, and each communications facility: a. Network Configuration Management b. Network Fault Management c. Network Performance Management d. Network Security Management
			ESN-0007#B	The ESN shall restrict the use of ECS inter-DAAC wide area networks for data transmission between ECS DAACs and other facilities that are directly attached to the ECS external network.
			ESN-1365#B	The ESN shall isolate FOS with secure interfaces.